MANUFACTURING LINKAGES IN LAUNCESTON

Peter H. Hanson

VOLUME 2 - APPENDICES

Introduction

As indicated in the preface to the study, these appendices are provided as supporting evidence in the event that the reader might be unfamiliar with the study area, or require additional information. However, the text of the thesis is presented in a form that should permit the study to stand alone. Thus, the appendix volume is supplementary to the thesis, and is not considered crucial to an understanding of the arguments developed therein.

CONTENTS

TABLES

FIGURES

APPENDIX 1

LAUNCESTON, TASMANIA, AUSTRALIA

This appendix is intended for the reader unfamiliar with the study area, and is provided because an understanding of the environmental context and its implications for industrial processes and behaviour are important to the linkage objectives of the study. In particular, Launceston's regional context within the Tasmanian environment, the development of manufacturing in the Launceston urban area, and its status relative to national trends is relevant background information. Even before this, however, an assessment of the regional and economic context of Tasmania within the Australian nation warrants attention to provide the overall contextual framework within which local manufacturers operate. Whilst much of this information is in the form of a synthesis of existing analyses, the discussion represents an updated interpretation to coincide with the administration of the survey of manufacturers undertaken for the present study (1980-81). Specifically Launceston issues are pursued independently using secondary data sources where relevant.

A1.1 The status of Tasmania within the economic milieu of the nation.

Within the global community Australia is an economically developed nation, albeit in the semi-periphery (Taylor and Thrift, 1981b). However, along with the overall benefits accruing from such status (as generally accepted by Western society), there exist certain anomalies.

> Whatever the reason, there can be little doubt that an economy, to lift itself to higher income levels, must and will first develop within itself one or several regional centres of economic strength. This need for the emergence of "growing points" or "growth poles" in the course of the development process means that international and interregional inequality of growth is an inevitable concomitant and condition of growth itself (Hirschman, 1964, 623-624).

It will be demonstrated in the ensuing discussion that Tasmania is disadvantaged in the growth process relative to mainland Australia, and this has important ramifications for the evolution of manufacturing in the study area.

A1.1.1 Characteristics of the Tasmanian population.

The Commonwealth of Australia comprises the federation of six states, which together with the two major territories constitute the Australian nation. Tasmania is the smallest of the states with a population of 427,300 in 1981 (Tasmanian Yearbook, 1983), 2.9 per cent of the Australian total, and possesses the unique distinction within this national context of island status. It lies in the temperate zone approximately 240 kilometres south of the south eastern tip of the Australian mainland, separated by Bass Strait (Figure A1.1). The area of the state is 68,300 square kilometres, or 0.89 per cent of the total area of Australia. This is approximately one third the size of Victoria, the smallest of the mainland states, and thus contributes to the relatively high Tasmanian population density by Australian standards of 6.30 persons per square kilometre (Table A1.1).

Thus, size and separation present attributes peculiar to Tasmania. However, the social and economic life of the Tasmanian populace is further influenced by a degree of population decentralisation within the state not encountered elsewhere on the Australian mainland. In 1981 the proportion of the total population of the six states living in the respective capitals was 61.7 per cent. When the national capital is included, together with all

Table A1.1: Area and population of the states and territories of Australia, 1981.

States and Territories	Area ('000 km^2)	Area %	Population[1] ('000 persons)	Population[1] %	Density (persons/km^2)
New South Wales	801.6	10.43	5,237.1	35.09	6.53
Victoria	227.6	2.96	3,948.6	26.45	17.35
Queensland	1,727.2	22.48	2,345.3	15.71	1.36
South Australia	984.0	12.81	1,319.3	8.84	1.34
Western Australia	2,525.5	32.87	1,299.1	8.70	0.51
Tasmania	67.8	0.88	427.3	2.86	6.30
Northern Territory	1.346.2	17.52	122.8	0.82	0.09
Australian Capital Territory (A.C.T.)	2.4	0.03	227.3	1.52	94.71
AUSTRALIA	7,682.3	100[2]	14,926.8	100[2]	1.94

1. Census data adjusted for under-enumeration and subject to revision.
2. The sum of the percentage columns may not exactly equal the total stated because of rounding errors. This convention of using 100 for percentage totals is followed in all tables within the study.

Source: Australian Bureau of Statistics. (A.B.S.), Yearbook Australia, 1983.

other major centres of 100,000 or more persons, the proportion was 69.7 per cent of the total population of Australia. Overall, therefore, population is clearly concentrated in the major metropolitan centres, particularly in the

capital cities. However, this pattern is characteristic of the mainland states with the exception of Queensland (Table A1.2), but even there the proportion of the total population in major centres of greater than 100,000 persons was 53.3 per cent.

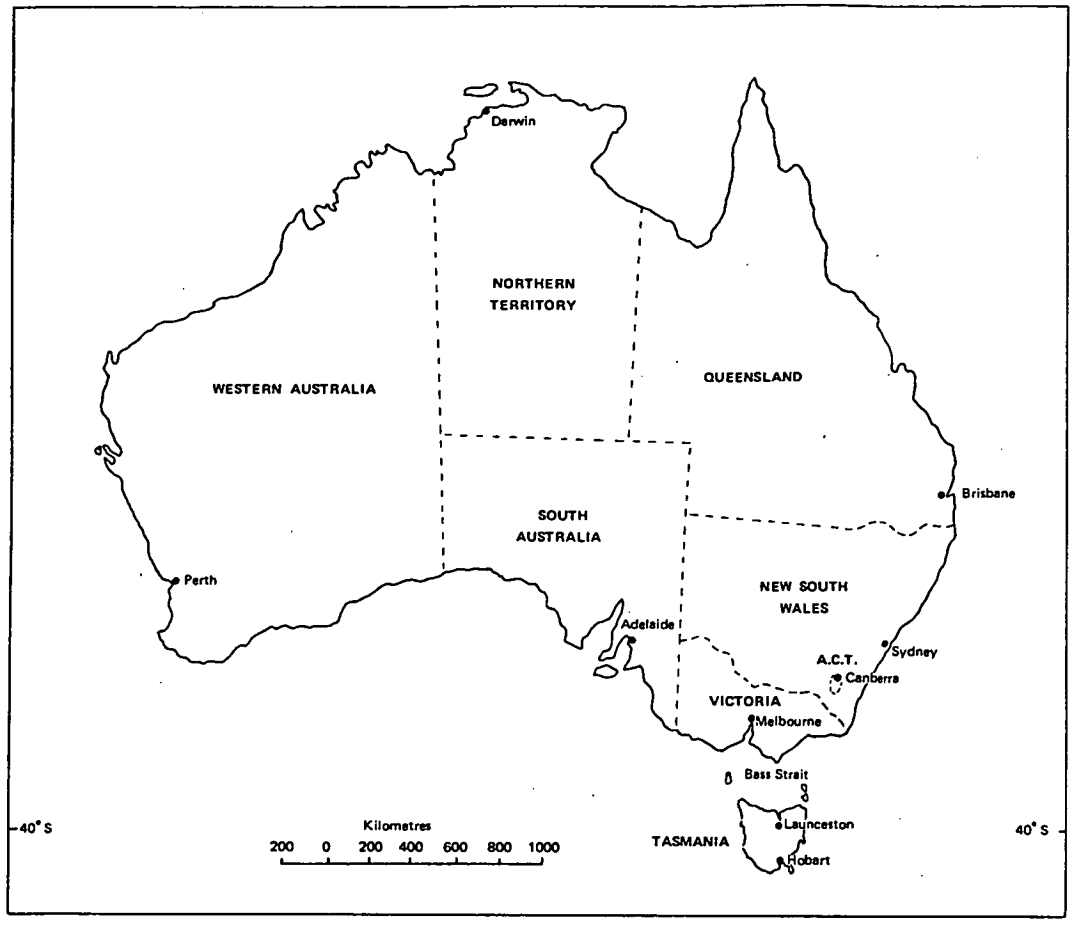


Figure A1.1: States and territories of Australia.

Table A1.2: Population in state capital cities, 1981.

Capital cities[2]	Population[1]	
	'000 persons	% of state total
Sydney (N.S.W.)	3,280.9	62.65
Melbourne (Vic.)	2,803.6	71.00
Brisbane (Qld.)	1,086.5	46.33
Adelaide (S.A.)	952.7	72.21
Perth (W.A.)	918.0	70.66
Hobart (Tas.)	170.9	40.00
TOTAL	9,212.6	61.72

1. Census data adjusted for under-enumeration and subject to revision.
2. Capital city statistical divisions.

Source: A.B.S., Yearbook Australia, 1983.

Clearly, Tasmania's population is the most decentralised of all states, with only 40.0 per cent of the total in the capital city (Hobart) statistical division compared with the national average of 61.7 per cent. The character of the Tasmanian distributional pattern is further emphasised in terms of capital city primacy. The second largest centre in Queensland is the Gold Coast statistical district containing 7.0 per cent of that state's population. For New South Wales and Victoria the corresponding centres and statistics are Newcastle (7.7 per cent) and Geelong (3.6 per cent) respectively. Thus, capital city ascendancy is a characteristic of all mainland states, yet in Tasmania the second largest centre, Launceston, had a statistical district population of 86,810 in 1981, 20.3 per cent of the state's population.

This situation has developed in part as a result of historical considerations, with both Launceston and Hobart being settled at virtually the same time, and in part by the existence of port facilities at each centre allowing the hinterland effectively to divide and focus upon the nearest port (Solomon, 1972). As a consequence, Launceston offers many higher order services and facilities normally satisfied by state capital cities, and because of its proximity, many other services are obtained from the larger mainland centres, notably Melbourne, rather than from Hobart. Launceston has, however, retained secondary status within Tasmania's settlement hierarchy, primarily as a result of institutional factors. Designation of capital city status for Hobart, and thus the location for the Houses of Parliament and concentration of the State Public Service, has provided the impetus to ensure Hobart's relative ascendancy.

This degree of population decentralisation, occurring as it does within an already small and isolated population, has profound effects for the Tasmanian economy, particularly in relation to issues such as the size and concentration of labour markets, and the size and concentration of demand for goods and services. These aspects will be dealt with more specifically in a subsequent section.

Not only is Tasmania's population very small relative to the other mainland states, and to the nation as a whole, but based on current trends the 1981 proportion of 2.9 per cent of the total Australian population is likely to decline further (Table A1.3). Inter-censal growth rates in Tasmania since 1954 have been consistently lower than those of the nation overall, resulting in a steady relative decline of the Tasmanian population.

Table A1.3: Population growth 1954-1981, Tasmania and Australia.

Census[1]	Tasmania share of national population (%)	Average annual inter-censal increase[2]	
		Tasmania	Australia
1954	3.44	-	-
1961	3.33	1.80	2.26
1966	3.20	1.17	2.00
1971	3.05	1.42	2.41
1976	2.94	0.69	1.44
1981	2.86	0.72	1.24

1. Based on census data as recorded up to 1966, and census data adjusted for under-enumeration, which includes full-blood Aboriginals, from 1966.

2. Annual rate of increase = $\left(\sqrt[t]{\frac{Pl}{Po}} - 1 \right) \times 100$

Po = population at beginning of period.
Pl = population at end of period. t = number of years.

Source: A.B.S. Tasmanian Yearbook, 1979, 1983. Author's calculations.

This relative decline is not the result of fertility and mortality differentials, however. The reason is negative net migration which has emerged as one of the most enduring characteristics of the dynamics of Tasmania's population, and of interstate migration in Australia generally (Rowland, 1979; Hugo, 1983). Various studies have demonstrated that the greatest proportion of out-migrations from the state occur within the younger age groups, particularly young adults within the age range 15-24,[1] and that approximately 50 percent of those leaving the state are employed within the professional, managerial, administrative, clerical and the highly skilled trade occupations (State Planning Co-ordinator, 1976; Callaghan, 1977; Rowland, 1979). Whilst the incidence of very young adults moving out of the state includes an element of school leavers, thereby suggesting that educational and social motivations are important, the prospect of new or enhanced employment opportunities is the prime motivational force for such movements. Tasmania does not offer the range of economic and social opportunities available on the mainland, particularly the concentration of such opportunities as exist in mainland capital cities which are the principal destinations of persons leaving the State (Callaghan, 1977).

The relative decline in Tasmania's population is, therefore, an indication of a relatively depressed level of development in the Tasmanian economy. There exists an imbalance between natural increase in the population and growth of the local economy, resulting in a net exodus from the state. Of special relevance is the fact that this has not occurred in

---

1 It is within this age range that there is not an equivalent counter stream of interstate migrants (Hugo, 1983).

response to isolated economic crises, it has been an ever present trend.

> ..... migration from Tasmania, far from being a response to dramatic economic changes, was the outcome of gradual persistent processes, especially the maturing of new generations, which continuously supplies new entrants to the labour force (Rowland, 1979, 44).

This imbalance in natural increase of the population and economic growth is reflected in employment statistics. As with population growth in general, Tasmania's employed population continues to grow, yet again the rate of growth is lower than that pertaining to the nation as a whole, with the result that Tasmania's share of total national employment is decreasing steadily (Table A1.4).

Table A1.4: Employed population, Tasmania and Australia.

Census[1]	Employed population		Inter-censal change (%)		Tasmanian share (%)
	Tasmania	Australia	Tasmania	Australia	
1954	116,502	3,647,008	-	-	3.19
1961	126,827	4,052,490	+ 8.86	+11.12	3.13
1966	145,205	4,778,764	+14.49	+17.92	3.04
1971	150,215	5,240,428	+ 3.45	+ 9.66	2.87
1976	163,945	5,788,145	+ 9.14	+10.45	2.83
1981	170,402	6,292,631	+ 3.94	+ 8.71	2.71

1. Based on data as recorded at the census.
Source: A.B.S., Census of Population and Housing, 1954, 1961, 1966, 1971, 1976, 1981.
Author's calculations.

Nevertheless, employment growth as an indicator of economic development must be tempered with the fact that a substitution of capital for labour may result in a rapidly expanding economy coupled with restricted employment growth. This is not the case in Tasmania, however.

Thus, the links with general income levels and, accordingly, general economic well-being of a regional population (Lloyd and Dicken, 1972, 187) are compounded.

Indeed, generally lower household income in Tasmania is evinced by the higher proportions in the poor to very poor categories relative to a national standard based on poverty levels developed by Henderson (1975). The major factors contributing to lower household incomes are lower average weekly earnings, higher unemployment (especially youth unemployment), lower labour force participation (especially among females), and an age structure of the population reflecting a consistently higher dependency ratio than for the nation as a whole - all of which contribute to a per capita welfare expenditure in the state that is higher than the national average (State Planning Co-ordinator, 1975-76, 1976; Callaghan, 1977).

The prime cause is related to an inadequate level of employment opportunities in the state; the expansion of the Tasmanian economy has not been commensurate with natural increases in the population. Moreover, the lower average weekly earnings of employed male units is interesting since differentials in wage rates are not a factor. Award rates for the majority of income earners are either nationally uniform, or are state awards which are generally established on the basis of national patterns, although there may be some minor variation in the incidence of over award payments. Equally interesting is the relatively low labour force participation rate of women. Not only is this a reflection of limited economic growth and thus reduced employment opportunities in general, but it also suggests an industrial structure in which the range of employment opportunities is

somewhat limited, particularly for women; and for those that do exist there would seem to be a higher concentration in areas for which average wage rates tend to be lower relative to those across the whole range of industrial sectors in proportions that apply nationally.

Thus, structural differences between the Tasmanian and the Australian economy would appear to be a particularly important element underlying the regional disparities that exist. Indeed, an assessment of the economic problems facing Tasmania indicate that along with peculiarly regional issues, structural adjustment processes that accompany economic development are operating to the detriment of the local economy. It will be demonstrated that these, collectively, result in the emergence of a distinct core/periphery differential as an explanation of the economic ills facing Tasmania.

A1.1.2 Economic problems in Tasmania.

Tasmania has been influenced by the combination of a number of factors culminating in a degree of economic stagnation not experienced at the state level elsewhere in Australia. Broadly, these factors relate to the state's insularity from external markets and centres of technological innovation and commercial leadership upon which the economy is dependent because of the small, regionally dispersed local market, and an industrial structure which is oriented towards the natural resource base and largely controlled by interests outside Tasmania. Whilst these circumstances are common to most peripheral economies, some elements are unique to Tasmania within the national context, and are shared only by similarly placed

administrative units within other national economies, for example Newfoundland. Many of these problems have received considerable attention as a result of initiatives at the state level, especially during the mid 1970s (for example: Pak-Poy, 1971; Economic Research Unit, 1975; State Planning Co-ordinator, 1975-76,1976; Nimmo, 1976; Plant Location International, 1976; Young, 1976; Callaghan, 1977). As will be demonstrated, however, policies at the local level are of limited effectiveness within the context of national and international economic adjustment.

A1.1.2.1 Insularity.

The nationally unique distinction of island status for Tasmania results in a level of isolation which has immense repercussions for economic development within the state. Perhaps the most serious problem emanating from this situation is that only in the case of Tasmania does interstate transport of goods necessarily involve sea or air travel. This has resulted in a financial disadvantage and problems of unreliability, both of which have important repercussions for Tasmanian producers. The financial disadvantage is especially evident among those firms serving mainland Australian markets. The general cost of moving non-bulk goods between Tasmania and the mainland has been found to be higher than moving them over comparable distances on the mainland (Nimmo, 1976). The extent of the disadvantage resulting from the movement of bulk cargoes by sea to international markets is less clear, however. Where direct shipping services are available costs are comparable, thus the issue relates to

those goods which have to be centralised at mainland ports prior to overseas shipment. Nimmo (1976) concluded that there is no financial disadvantage to Tasmanian producers because the cost of centralising these cargoes is borne by the overseas shipping companies. Yet Callaghan (1977), in response to subsequent direct contact with Tasmanian companies, suggested that this is not the case, that indeed many of the local producers do suffer the additional cost burden resulting from transhipment of goods.

> In effect, the lack of shipping access has restricted the range of goods able to be economically exported and has generally prevented access to some international markets. These specific disadvantages coupled with the small size of the Tasmanian domestic market have in fact encouraged some companies to transfer segments of their export operations to the mainland at the expense of Tasmania (Callaghan, 1977, 10).

In response to the Nimmo Inquiry, a freight equalisation scheme was introduced in 1976 in the form of a subsidy to the consignors for cargo shipped from Tasmania to the mainland, with the intention of placing the respective sea freight rates on a par with overland freight rates for similar distances on the mainland. The subsidy does not apply to bulk cargoes, overseas cargoes centralised at mainland ports, or to air cargo, however. In 1977 the scheme was extended to subsidise Australian produced, south-bound, non-bulk cargoes of producers' material and equipment which represents greater than five per cent of the factory door cost of finished products. On these bases, payments to Tasmanian producers totalled $29.5 million in 1980-81, of which 93 per cent applied to goods forwarded from the state and seven per cent to material and equipment brought in (Tasmanian Yearbook, 1982). Thus, the actual transport cost incurred in

moving goods across the Bass Strait barrier is no longer a disadvantage for many Tasmanian producers. However, freight movements that do not qualify for assistance under the scheme continue to generate additional cost burdens, and all producers continue to suffer the disadvantages of realiability and convenience.

Problems experienced by those producers transhipping goods at mainland Australian ports remain unless the overseas shipping lines pay the centralisation cost, as do those for producers of generally high value goods using air freight to achieve faster turnaround: for example, textile, clothing and footwear manufacturers, and suppliers of perishable goods. A further consequence of Tasmania's total reliance on sea or air freight, and one which manufacturers indicated during the administration of the survey associated with this study as being of equal importance to higher freight rates, is the irregularity and unreliability of transport services to and from the mainland. With the introduction of freight equalisation to alleviate the actual transport cost burden, this problem has now assumed greater proportions. A combination of high levels of industrial disputation, particularly associated with the maritime unions, and to some extent lower efficiency levels arising primarily out of the original attempts to subsidise the shipping lines rather than the producers, together with a greater incidence of damage to goods, have limited the ability of the Tasmanian economy to compete in mainland Australian markets (Callaghan, 1977).

Disruptions to production are a serious problem resulting in the tendency for Tasmanian firms to have higher than normal raw material stock

holdings which represents the freezing of substantial amounts of capital, and results in higher inventory and storage costs (Nimmo, 1976). Likewise, transport delays often result in the loss of sales and jeopardise the firm's ability to retain its share of the market. In fact, the simple time factor associated with the normal operation of transporting goods by sea acts to the detriment of Tasmanian firms. These factors are especially important to firms meeting short term fluctuations in demand, thus the increasing use of air freight from Tasmania. Yet this mode of transport is also prone to delays and industrial disruption, even though the incidence is lower than for sea transport.

Unfortunately, the transfer of goods is not the only disadvantage suffered because of the state's isolation. Access to a vast range of services is necessary, and an effective communications link with centres of technological and fashion innovation, plus commercial leadership, is vital for an efficient, vigorous and expanding economy. Since most of this must be sought from mainland centres, Tasmanian firms carry an additional financial disability. This is not to suggest that the cost of specific forms of communication is necessarily any greater from Tasmania, but the frequency with which these contacts must be made due to the relative levels of isolation adds to overall operational costs (Callaghan, 1977). In effect, Tasmania is on the periphery of an effective information and communications network. If the contacts are not maintained, competitiveness is lost and efficiency and viability of the firm, and ultimately the overall economy, suffers.

A1.1.2.2. Size and distribution of the domestic market.

Tasmania's 1981 population of 427,300 presents a very small domestic market, and its slow growth offers little potential for future improvement. A small population limits the scale at which domestic producers are able to operate, rendering them less efficient, and restricts the range of services and facilities available, whilst a slow population growth results in a limited local demand for capital goods for housing and construction activities (Callaghan, 1977). Thus, the presence of large scale industrial enterprises in Tasmania is largely dependent upon the existence of mainland and overseas markets, and further economic development can only be stimulated by increasing the state's share of these markets.

Of further relevance is the extent to which the local market is dispersed within the state. Approximately 60 per cent of the population is located outside the capital city statistical division which precludes the development of a single, dominant demand and labour market concentration (with obvious repercussion for scale economies) such as exist in each mainland Australian state (Refer Table A1.2). The four major urban centres in Tasmania - Hobart, Launceston, Burnie and Devonport - accounted for 56.1 per cent of the population (77.3 per cent for the relevant statistical units) at the 1981 census. With the juxtaposition of Burnie and Devonport, it is convenient to refer to three population concentrations representing three distinct markets. These are, in fact, the economic nodes of the three identifiable and to a large extent independent regions of the state which parallel the structure of Tasmanian statistical areas (Table A1.5 and Figure A1.2).

Table A1.5 : Regional distribution of the Tasmanian population.[1]

Region	Population						Percentage change	
	1971		1976		1981			
	Persons	%	Persons	%	Persons	%	1971-76	1976-81
Southern:	183,170	46.9	192,670	47.3	197,759	47.2	+5.2	+2.6
Hobart Statistical Division	153,140	39.2	162,660	39.9	168,359	40.2	+6.2	+3.5
Urban Hobart	129,928	33.3	132,027	32.4	128,603	30.7	+1.6	-2.6
Northern:	106,910	27.4	111,000	27.2	114,723	27.4	+3.8	+3.4
Launceston Statistical District	n.a.	n.a.	82,330	20.2	84,781	20.2	n.a.	+3.0
Urban Launceston	62,241	16.0	63,629	15.6	64,555	15.4	+2.2	+1.5
North Western and Western:	99,730	25.6	103,120	25.3	106,021	25.3	+3.4	+2.8
Burnie-Devonport Statistical District	n.a.	n.a.	n.a.	n.a.	70,924	16.9	n.a.	n.a.
Urban Burnie	20,087	5.1	19,189	4.7	20,368	4.9	-4.5	+6.1
Urban Devonport	18,183	4.7	19,473	4.8	21,424	5.1	+7.1	+10.0
Migratory	410	0.1	570	0.1	454	0.1	+39.0	-20.4
TOTAL POPULATION	390,220	100	407,360	100	418,957	100	+4.4	+2.8

n.a. = Not available for publication (the unit was not defined at the census date).

1. In order to maintain consistency across the time series and for the urban populations within the regions, these figures are based on actual census counts rather than figures adjusted for under-enumeration.

Source: A.B.S., Census of Population and Housing, 1971, 1976, 1981.

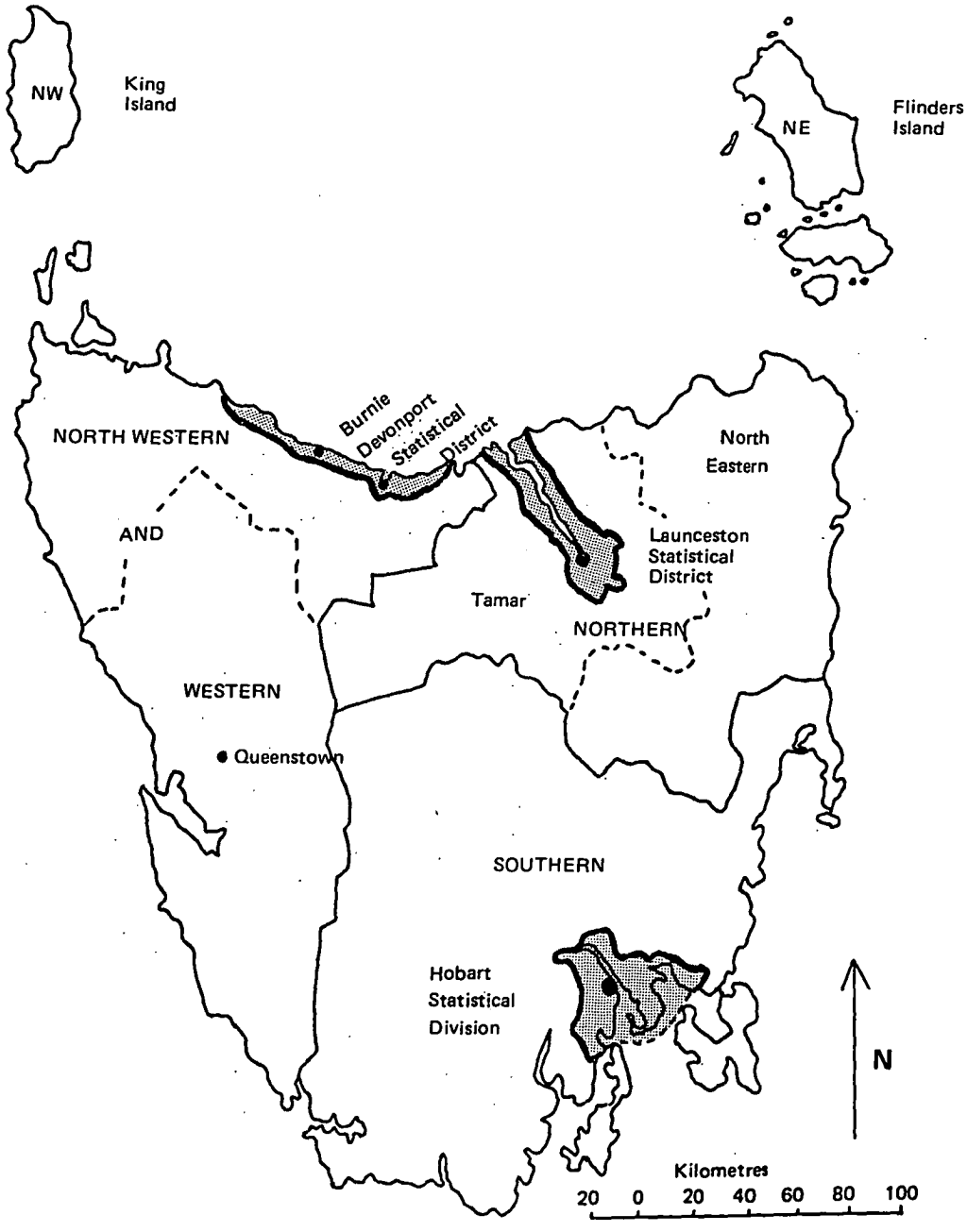


Figure A1.2: Tasmanian statistical area boundaries.

As mentioned earlier, this regional structure has arisen mainly as a result of historical considerations, aided by the location of natural harbours at each of the major population centres. This initial impetus has led to distinct regional identities being developed in the southern, northern and north western parts of Tasmania. Parochialism is rife, with interregional jealousies being most pronounced between the southern and northern halves of the state. Given the nature of political processes in regions containing electorates as volatile as those in Tasmania, the level of decentralisation has been perpetuated. Consequently, there is unnecessary duplication of industrial and transport infrastructure and in the provision of the many other social and economic services throughout the state. For example, each of the four major centres are served by airports and sea ports, which means reduced economies of scale and results in infrequent and inconvenient air and shipping services at individual centres (Atkins-Meinhardt, 1976).

With this duplication of services and facilities, and the inherent dispersal of the labour force, industrial enterprises have been able to establish close to their source of supply and utilise the local port with the intention of minimizing the cost of transporting their products to outside markets (Nimmo, 1976). This has resulted in a considerable degree of regional diversification in the economic structure of the state, with individual regions displaying some specialisation based on the distribution of natural resources.

Whilst such dispersion of the labour force, local market and industry is considered a desirable feature in larger, more densely populated areas, it represents a disadvantage in Tasmania since the essential support for a

growing economy is lacking. There is a restricted range of professional and technical services within the state since no one centre is of sufficient size to provide the threshold level beyond which such functions may be viably provided. Thus, for specialised services, the Tasmanian economy is dependent upon the higher order mainland centres, particularly Melbourne, and obviously encounters the difficulties associated with access because of the state's relative isolation.

A1.1.2.3. Structure of the Tasmanian economy.

The structural distribution of the Tasmanian labour force in relation to that of Australia reflects a specialisation of the Tasmanian economy in resource based activities and the generation of hydro electric power, whilst the manufacturing and tertiary sectors are under-represented (Tables A1.6 and A1.7). If the less permanent deviations in industrial structure over the period 1971-81 are ignored, which include Communications and Recreational, personal and other services, the Tasmanian labour force exhibits a consistent pattern of specialisation in Mining, Electricity, gas and water, Agriculture, forestry, fishing and hunting, and to some extent Community services (Table A1.7).[2] This represents a narrow range of specialisation, concentrated in areas which account for relatively small proportions of the state's employed population (a combined total of

---

2 In order to avoid abbreviation, and also to differentiate clearly one category of industrial activity from another, this study adopts the convention of capitalising references to individual industrial divisions and sub-divisions. Refer to Table A1.6 for a complete list of industrial divisions, and Table A1.9 for a complete list of manufacturing sub-divisions, in this format.

Table A1.6 : Employment by industry, Tasmania and Australia.

Industry division[1]	Tasmania					Australia					Percentage change 1971-81	
	Employment (%)[2]			Percentage change		Employment (%)[2]			Percentage change			
	1971	1976	1981	1971-76	1976-81	1971	1976	1981	1971-76	1976-81	Tasmania	Australia
Agriculture, forestry, fishing and hunting	9.2	7.8	7.6	- 7.7	+ 2.2	7.4	7.0	6.0	+ 4.7	- 6.2	- 5.6	- 1.8
Mining	3.0	2.6	2.5	- 8.0	+ 2.4	1.4	1.3	1.4	- 4.4	+22.4	- 5.9	+17.1
Manufacturing	21.0	16.9	15.3	-12.2	- 5.6	23.2	19.7	17.7	- 6.3	- 2.1	-17.2	- 8.3
Electricity, gas and water	2.5	1.9	2.7	-13.6	+45.9	1.7	1.8	2.0	+12.9	+22.0	+26.0	+37.7
Construction	8.6	7.7	6.4	- 2.5	-12.9	7.9	7.4	6.3	+ 4.2	- 7.3	-15.1	- 3.4
Wholesale and retail trade	18.0	17.8	17.1	+ 7.5	- 0.2	18.9	18.0	17.4	+ 5.7	+ 4.7	+ 7.2	+10.7
Transport and storage	5.1	5.0	4.8	+ 8.8	- 1.3	5.2	5.0	5.2	+ 6.4	+14.6	+ 7.4	+21.3
Communications	2.2	1.9	2.0	- 3.1	+ 8.5	2.0	1.9	2.0	+ 7.0	+13.4	+ 5.1	+21.3
Finance, property and business services	5.2	6.0	6.3	+26.1	+ 9.1	6.9	7.2	8.4	+15.0	+27.2	+37.5	+31.6
Public administration and defence	4.8	4.7	5.2	+ 7.7	+13.9	5.4	5.6	5.6	+14.5	+ 9.0	+22.7	+19.9
Community services	11.8	15.0	17.4	+38.0	+20.8	10.8	13.4	14.9	+38.1	+20.5	+66.8	+66.4
Recreational, personal and other services	5.1	5.8	6.0	+24.6	+ 7.6	5.1	4.9	5.2	+ 5.5	+16.7	+34.0	+23.0
Other and not stated	3.6	7.0	6.6	+98.7	- 0.9	4.1	6.8	7.7	+80.5	+23.4	+110.2	+122.8
TOTAL	100	100	100	+ 9.1	+ 3.9	100	100	100	+10.5	+ 8.7	+13.4	+20.1
No. employed ('000)	150.2	163.9	170.4			5,240.4	5,788.1	6,292.6				

1. 1971 and 1976 data are structured according to the 1969 version of the Australian Standard Industrial Classification (A.S.I.C.). 1981 data are based on A.S.I.C. (1978). The impact of the industrial classification revision is minimal at the A.S.I.C. division level. For example, Australian manufacturing employment was reduced by about 0.13 per cent (Rich, 1982), and the equivalent figure in Tasmania was approximately 0.3 per cent.

2. Based on data as recorded at the census.

Source: A.B.S., Census of Population and Housing, 1971, 1976, 1981.

Author's calculations.

12.8 per cent in 1981 with the exclusion of Community services). At the other extreme, the greatest and most consistent under-representation exists in the areas of Finance, property and business services, Public administration and defence, Manufacturing, and to a lesser extent Wholesale and retail trade. Of particular importance, is the fact that two of these under-represented industrial divisions, Manufacturing and Wholesale and retail trade, exhibit the greatest impact in terms of employment generation within the national industrial structure.

Table A1.7: Employment specialisation in Tasmania relative to Australia.

Industry division	1971			1976			1981		
	Difference in %[1]	L.Q.[2]	Rank	Difference in %[1]	L.Q.[2]	Rank	Difference in %[1]	L.Q.[2]	Rank
Agriculture, forestry, fishing and hunting	+1.8	1.243	3	+0.8	1.114	4	+1.6	1.267	3
Mining	+1.6	2.143	1	+1.3	2.000	1	+1.1	1.786	1
Manufacturing	-2.2	0.905	10	-2.8	0.858	11	-2.4	0.864	11
Electricity, gas and water	+0.8	1.471	2	+0.1	1.056	5	+0.7	1.350	2
Construction	+0.7	1.089	6	+0.3	1.041	6	+0.1	1.016	6
Wholesale and retail trade	-0.9	0.952	9	-0.2	0.989	10	-0.3	0.983	8
Transport and storage	-0.1	0.981	8	0.0	1.000	8	-0.4	0.923	10
Communications	+0.2	1.100	4	0.0	1.000	9	0.0	1.000	7
Finance, property and business services	-1.7	0.754	13	-1.2	0.833	13	-2.1	0.750	13
Public administration and defence	-0.6	0.889	11	-0.9	0.839	12	-0.4	0.929	9
Community services	+1.0	1.093	5	+1.6	1.119	3	+2.5	1.168	4
Recreational, personal and other services	0.0	1.000	7	+0.9	1.184	2	+0.8	1.154	5
Other and not stated	-0.5	0.878	12	+0.2	1.029	7	-1.1	0.857	12

1. Differene in % = percentage employment in industry x in Tasmania - percentage employment in industry x in Australia.

2. L.Q. = Location Quotient = $\frac{\text{Employment in industry x in Tasmania}}{\text{Total employment in Tasmania}} \div \frac{\text{Employment in industry x in Australia}}{\text{Total employment in Australia}}$

L.Q. > 1: over-represented. L.Q. < 1: under-represented. L.Q. = 1: equal share.

Source: Author's calculations based on data in Table A1.6.

Clearly, an economy with such narrow specialisations is at considerable risk as the processes of structural adjustment proceed, particularly since the narrowness of the economic base is characterised by even further specialisation within the primary sector.

> In the rural sector 5 product groups dominate, each accounting for between 13 and 16 per cent of the value of rural output and of these 3 are based on sheep or cattle which form the major industry on 77 per cent of the State's farms (ABS, 1978). The five product groups are fruit and vegetables, dairy produce, wool, cattle and sheep meat, and forest products for paper making, two thirds of it for export wood chips. The metallic mining industry is also narrowly specialised, dominated by five minerals - iron, zinc, copper, tin and tungsten oxide (Wilde, 1980b,1).

The extent to which this structure is contributing to economic problems of the state is evident in Table A1.6. Over the period 1971-81, the Tasmanian economy exhibited absolute employment losses in all primary and secondary sectors of the economy except Electricity, gas and water, and even in this traditionally vital component of the local economy (the generation of hydro electric power), growth failed to match that of the nation as a whole. In the national economy on the other hand, declines in these areas were considerably less substantial in relative terms, and indeed an upsurge in the Mining sector activity over the 1976-81 period witnessed a net increase in primary sector employment nationally over the period under review.

In the remaining (tertiary) sectors, absolute increases occurred in Tasmania, and nationally, although proportional increases were generally higher in the overall Australian economy. For Recreational, personal and other services only did relative growth in Tasmania substantially overshadow that in Australia, but even here the relative growth was not sustained over the entire period, being concentrated in the first half of the decade. Other areas in which Tasmanian growth was marginally greater or approximately equivalent were Finance, property and business services, Public administration and defence, and Community services. In all other divisions Tasmania suffered relative declines.

Thus, Tasmania is suffering relative to Australia from structural decline in the primary and secondary sectors. With respect to the tertiary sector, Tasmanian employment was below the national average in 1971, although this discrepancy was removed by 1976 (Table A1.8). Coupled with the decline in the primary and secondary sectors, this was brought about by a slightly higher proportional increase in the tertiary sector over the period 1971-76 (+17.6 per cent for Tasmania compared with +14.3 per cent for Australia), but it was not maintained over the second half of the decade. Employment growth in the tertiary sector of the Australian economy remained relatively static (+14.0 per cent, 1976-81), whilst the equivalent growth in Tasmania was only 8.6 per cent. Over the decade as a whole, therefore, the Tasmanian economy has witnessed greater declines in the primary and secondary sectors (perhaps the result of a time lag in structural adjustment processes), and has not participated in compensating growth in the tertiary sector to the same extent as the nation overall, with the most recent trends indicating that this situation may be worsening.

Table A1.8: Employment in Primary, Secondary and Tertiary sectors, Tasmania and Australia (%).

	1971		1976		1981		Percentage change (1971-81)	
Industry division	Tasmania	Australia	Tasmania	Australia	Tasmania	Australia	Tasmania	Australia
Primary	12.2	8.8	10.4	8.3	10.1	7.4	- 5.7	+ 1.3
Agriculture, forestry, fishing and hunting	9.2	7.4	7.8	7.0	7.6	6.0	- 5.6	- 1.8
Mining	3.0	1.4	2.6	1.3	2.5	1.4	- 5.9	+ 17.1
Secondary	32.1	32.8	26.5	28.9	24.4	26.0	- 13.3	- 4.7
Manufacturing	21.0	23.2	16.9	19.7	15.3	17.7	- 17.2	- 8.3
Tertiary	52.2	54.3	56.2	56.0	58.8	58.7	+ 27.7	+ 30.3
Other and not stated	3.6	4.1	7.0	6.8	6.6	7.7	+110.2	+122.8
TOTAL	100	100	100	100	100	100		

Source: Author's calculations based on data in Table A1.6

Clearly, such a rudimentary analysis fails to discriminate the elements of change associated with the particular industrial structure of the area and a regional competitive effect as identified via a shift and share analysis.[3] From such an analysis over the period 1961-76, Wilde has demonstrated that 'an industry mix favouring growth in the 1961-66 period became increasingly unfavourable in the succeeding periods and there was a firmly negative competitive change element throughout' (1980b,6). This applied to the tertiary sector particularly, where competitive losses were dominant in relation to national growth, resulting from the failure of the Tasmanian economy to participate equally in the structural adjustment processes (Wilde, 1980,b). Clearly, the most recent trends identified above are compounding this problem.

On these bases, therefore, explanation of the lower female participation in the labour force is readily apparent, largely a function of the state's slower growth in the tertiary sector. Similarly, the income differentials per employed male unit are explained. Higher status administrative, executive, clerical and, to some extent, professional and technical occupations, which command higher salaries, are under-represented in the Tasmanian labour force as indicated by the generally lower involvement in Finance, property and business services, and Public administration and defence industrial divisions. In particular, there is limited involvement of Commonwealth public service instrumentalities in the

---

3 Details of the shift and share technique are discussed in Section A1.3.

state (Callaghan, 1977), although in response to Callaghan's report some transfers have recently occurred. Additionally, reduced levels of commercial leadership are highlighted by the tendency for the head offices of the large industrial enterprises operating in Tasmania to be located on the mainland (Wilde, 1975a), and this tendency is not contracting (Taylor and Thrift, 1980a,1981a,1981c).

Since it is in employment areas such as these that higher national growth as a result of structural adjustment occurs, Tasmania gains little. 'In short, Tasmania suffers the losses but does not participate in the gains of structural adjustment' (Government of Tasmania, 1978, 9). Even in the areas in which Tasmania shows some specialisation of employment due to the comparative advantage offered by natural resources (agriculture forestry and mining), the actual and competitive changes have varied considerably. Whilst this reflects instability at both state and national levels, it reinforces the narrowness and unpredictability of the Tasmanian economic base, and overall, growth prospects in these areas are almost universally poor (Wilde, 1980b). Thus, the potential for arresting Tasmania's relative decline in the generation of employment opportunities is minimal.

Whilst the manufacturing sector is under-represented in Tasmania relative to Australia, it is, nevertheless, of considerable importance to the economy of the state. Because of its relevance to the current study, the analysis of this sector is pursued further.

A1.1.2.4. Structure of the Tasmanian manufacturing economy.

In addition to the activities of agriculture, forestry and fishing, plus the large mining operations, a number of large manufacturing enterprises also produce for export markets. The manufacturing sector is itself dominated by those activities which, on the whole, are closely related to the natural resource base of the state, resulting in a very specialised manufacturing economy relative to Australia as a whole. The five largest sub-divisions in terms of total employment and value added are Food and beverages, Paper, paper products and printing, Wood, wood products and furniture, Basic metal products and Textiles (Tables A1.9 and A1.10).

The importance of resource based activity to the Tasmanian economy is not an unusual phenomenon within the Australian context, however. It is the broadly based manufacturing structure of the dominant centres (Melbourne and Sydney) that largely determine the national context, and the general tendency for the smaller states and the country areas of large states is to be dominated by resource related manufacturing (Rich, 1981).

Nonetheless, what has been regarded as an overall broad spatial distribution of manufacturing in Australia (Linge, 1978), does include Tasmania. In addition to resource based activity, Tasmania contains a share of an essentially regional branch plant economy designed to cater to local markets, even though production costs at individual plants are likely to be relatively high because of a lack of scale economies. Linge (1978) has explained this in terms of the nation's size and highly urbanised, but spatially distant, centres of population. Firms have chosen to disperse

Table A1.9 : Manufacturing employment, Tasmania and Australia.

Manufacturing sub-division[1]	Tasmania					Australia					Percentage change 1972/73 - 1980/81	
	Employment (%)[2]			Percentage change		Employment (%)[2]			Percentage change			
	1972-73	1977-78	1980-81	1972/73-77/78	1977/78-80/81	1972-73	1977-78	1980-81	1972/73-77/78	1977/78-80/81	Tasmania	Australia
Food, beverages, tobacco	19.3	22.7	21.8	+ 3.5	- 5.6	15.7	16.9	15.5	- 4.4	-10.1	- 2.3	-14.1
Textiles	12.4	8.4	6.5	-39.9	-24.1	4.1	3.3	3.1	-30.8	- 6.9	-54.4	-35.5
Clothing and footwear	1.1	0.8	0.8	-31.7	- 8.3	8.6	7.1	7.0	-27.4	- 3.2	-37.4	-29.7
Wood, wood products and furniture	15.5	14.5	14.0	-17.2	- 5.3	6.4	6.6	6.9	- 8.9	+ 3.6	-21.5	- 5.6
Paper, paper products and printing	18.7	19.9	20.9	- 6.5	+ 3.3	8.2	8.5	9.0	- 8.3	+ 4.3	- 3.4	- 4.0
Chemical, petroleum and coal products	4.7	n.a.	4.0	n.a.	n.a.	5.0	5.4	5.0	- 6.2	- 8.6	-26.6	-14.3
Non-metallic mineral products	3.5	3.5	3.2	-12.4	-11.3	4.1	4.1	3.9	-12.3	- 6.1	-22.2	-17.7
Basic metal products	12.4	12.4	13.7	-12.2	+ 9.2	7.3	8.0	8.3	- 3.6	+ 1.5	- 4.1	- 2.2
Fabricated metal products	4.5	5.8	7.5	+14.9	+25.9	8.9	8.9	10.2	-12.2	+12.8	+44.7	- 1.0
Transport equipment	4.1	n.a.	2.3	n.a.	n.a.	11.8	11.8	11.3	-11.6	- 5.6	-50.2	-16.5
Other machinery and equipment	3.1	3.5	3.7	- 0.1	+ 3.6	14.2	14.0	14.3	-13.0	+ 0.02	+ 3.5	-12.9
Miscellaneous manufacturing	0.9	1.5	1.6	+44.2	+ 5.0	5.7	5.6	5.7	-13.0	- 0.04	+51.4	-13.0
TOTAL	100	100	100	-11.9	- 1.8	100	100	100	-11.7	- 1.6	-13.5	-13.1
No. employed ('000)	30.7	27.0	26.5			1,297.6	1,146.0	1,127.2				

n.a. = not available for publication.

1. 1972-73 and 1977-78 data are based on the 1969 version of the Australian Standard Industrial Classification (A.S.I.C.).
   1980-81 data based on A.S.I.C. (1978).
   The A.S.I.C. (1978) revision reduced registered manufacturing employment in Australia by about 0.13 per cent (Rich, 1982).
   Its impact at the A.S.I.C. sub-division level is minimal, although Tasmanian manufacturing employment in basic metal products was reduced by 2.0 per cent.
2. Excludes single establishment operations employing less than four persons from 1977-78. Such operations accounted for 2.2 per cent of Australia's manufacturing labour force in 1980-81.

Source: A.B.S., Manufacturing establishments, Tasmania and Australia, 1972-73, 1977-78, 1980-81.
Author's calculations.

Table: A1.10: Value added in manufacturing, Tasmania and Australia.[1]

Manufacturing sub-division[2]	Tasmania					Australia					Percentage change 1972/73-1980/81	
	Value added (%)[3]			Percentage change		Value added (%)[3]			Percentage change			
	1972-73	1977-78	1980-81	1972/73-77/78	1977/78-80/81	1972-73	1977-78	1980-81	1972/73-77/78	1977/78-80/81	Tasmania	Australia
Food, beverages, tobacco	23.0	22.4	19.7	- 5.5	- 6.9	18.1	18.6	17.6	+ 3.2	+ 1.3	-12.1	+ 4.7
Textiles	7.4	7.4	4.7	- 3.3	-33.4	3.5	2.9	2.7	-17.1	- 0.5	-35.6	-17.5
Clothing and footwear	0.4	0.4	0.5	+ 4.0	+46.2	5.2	4.8	4.4	- 8.4	- 0.8	+52.0	- 9.1
Wood, wood products and furniture	14.1	14.0	15.1	- 3.9	+13.9	5.4	5.6	5.6	+ 3.5	+ 7.9	+ 9.5	+11.6
Paper, paper products and printing	17.0	21.2	23.3	+21.3	+15.7	8.5	8.7	9.0	+ 2.9	+10.0	+40.3	+13.2
Chemical, petroleum and coal products	6.0	n.a.	4.4	n.a.	n.a.	8.2	8.4	8.8	+ 1.9	+13.0	-25.4	+15.1
Non-metallic mineral products	4.6	3.3	3.7	-30.0	+17.4	5.2	5.1	5.1	- 1.5	+ 6.0	-17.8	+ 4.4
Basic metal products	18.4	14.4	18.0	-24.0	+128.1	9.4	9.7	11.2	+ 4.7	+22.6	0.0	+28.4
Fabricated metal products	3.2	4.5	5.1	+36.5	+21.1	8.1	8.1	8.8	+ 1.4	+15.2	+65.3	+16.7
Transport equipment	3.5	n.a.	1.6	n.a.	n.a.	10.0	10.0	9.0	+ 0.7	- 4.6	-52.4	- 3.9
Other machinery and equipment	1.7	2.5	2.5	+39.0	+ 2.9	12.9	12.8	12.7	- 0.1	+ 5.3	+43.1	+ 5.2
Miscellaneous manufacturing	0.7	1.4	1.4	+87.8	+10.9	5.4	5.3	5.2	- 1.5	+ 5.6	+108.2	+ 4.0
TOTAL	100	100	100	- 3.2	+ 5.6	100	100	100	+ 0.6	+ 6.8	+ 2.4	+ 7.5
Value added ($ million)[3]	697	675	713			26,471	26,625	28,447				

n.a. = Not available for publication.

1. Value added data are based on 1980-81 values. Conversion factors based on implicit price deflators for expenditure on gross domestic product, Australian National Accounts (A.B.S.), 1980-81.

2. 1972-73 and 1977-78 data based on A.S.I.C. (1969). 1980-81 data based on A.S.I.C. (1978).
The 1978 revision raised value added in Australia by about 0.003 per cent and similarly small changes resulted from a revised definition of value added, introduced in 1978/79 (Rich, 1982). Its impact at the A.S.I.C. sub-division level is minimal. Value added data on the impact for Tasmania are unavailable. Note, however, the impact for employment (Table A1.9).

3. Excludes single establishment operations employing less than four persons from 1977-78. There is no information available from which the relative contribution of such firms to the total value added in Australian manufacturing may be indicated.

Source: A.B.S., Manufacturing establishments, Tasmania and Australia, 1972-73, 1977-78, 1980-81.

Author's calculations.

production within the fragmented market, and capitalise on lower distribution costs at the expense of higher production costs. This practice has been aided by government policy at the state level and various forms of protection at the national level. However, changing economic conditions through increases in production costs relative to transport costs, and increasing competitive pressures, mean that the ability to sustain this pattern is being eroded (Rich, 1981); and Tasmania is particularly vulnerable to such changes because of its limited market and its proximity to Melbourne.

Clearly, however, resource based manufacturing activity is pre-eminent in Tasmania as shown in Table A1.11, where the dominant elements of the Tasmanian economy as detailed in the previous tables are summarised in terms of employment generated.

Table A1.11: Dominant sub-divisions in the Tasmanian manufacturing economy.

Manufacturing sub-division[1]	1972-73		1977-78		1980-81	
	Employment (%)[2]	L.Q.[3]	Employment (%)[2]	L.Q.[3]	Employment (%)[2]	L.Q.[3]
Food, beverages, tobacco	19.3	1.229	22.7	1.343	21.8	1.406
Paper, paper products and printing	18.7	2.280	19.9	2.341	20.9	2.322
Wood, wood products and furniture	15.5	2.422	14.5	2.197	14.0	2.029
Basic metal products	12.4	1.699	12.4	1.550	13.7	1.651
Textiles	12.4	3.024	8.4	2.545	6.5	2.097
SUB-TOTAL: Dominant sub-divisions	78.3		77.9		76.9	

1. Ranked by percentage share of total manufacturing employment 1972-73.
2. Percentage share of total manufacturing employment.
3. Location quotient as defined in Table A1.7.

Source: Author's calculations based on data in Table A1.9.

Moreover, the pattern is virtually the same when value added is used as the measure except that Basic metal products assume greater importance.

Virtually 80 per cent of Tasmanian employment and value added in manufacturing is contributed by these activities. Furthermore, they are the only categories for which the location quotient exceeds 1.0, and the respective values emphasise the degree to which the Tasmanian manufacturing sector specialises in these areas in relation to Australia. The manufacturing activities least represented in the Tasmanian economy are Clothing and footwear, Miscellaneous manufacturing, Other machinery, industrial equipment and household appliances, and Transport equipment. Rich (1981) describes this as the traditional non-major metropolitan pattern. Thus, Tasmania is very dependent on outside sources, principally mainland Australia (on the basis of high priced tariff protection), for a wide range of manufactured items, the most important being agricultural and industrial machinery and equipment of all forms, motor vehicles, household appliances, clothing and footwear.

The relationship between the manufacturing sector and the state's natural resource base of agricultural land, forests, minerals and permanently flowing rivers in areas of high relief is therefore obvious. The latter has facilitated the long term efforts of successive state governments to stimulate industrial development by the provision of relatively cheap hydro electric power. Indeed, the introduction of large processing activities such as the refining of aluminium and zinc, the production of carbide (since closed), ferro-manganese, and to some extent pulp and paper (although the availability of timber resources is more important in this case), is largely attributable to these efforts. However, its continuing effectiveness is the subject of current debate within Tasmania, and the exact situation is difficult to ascertain, although it

would appear that high energy consuming developments of the magnitude experienced prior to the 1960s are unlikely to be repeated.

The least dominant of the five most important manufacturing sub-divisions is Textiles, and this is the one least related to the natural resource base of the state. Nonetheless, the original impetus for its concentration in Tasmania was aided to some extent by natural environmental factors, particularly climate and water supply, and in some instances locally produced wool is the principal input. However, Wilde (1980b) has indicated that it is this sub-division that accounts for approximately 50 per cent of Tasmanian employment in the overall relatively small proportion of manufacturing industry that he considers has been 'filtered down' from national cores in the mature stages of the production cycle via the establishment of branch plants in regional labour markets.

This suggests a different perspective from which to view the Tasmanian manufacturing economy. Export orientation of the state's manufacturing is primarily restricted to those firms involved in the initial processing of natural resources, and the proportion of total manufacturing employment in these activities has been estimated at approximately 44 per cent (Wilde, 1980b). To this is added the relatively small proportion of 'filtered down' manufacturing enterprises providing less than 15 per cent of Tasmania's exports and employing approximately 18 per cent of the manufacturing labour force. The remaining 38 per cent are employed in the production of goods for the domestic market. Clearly, therefore, Tasmania offers little beyond its narrow range of natural resources which will serve to encourage large mainland companies to

establish branch plants in the state, other than to serve the domestic market, resulting in a conspicuous absence of the large capital and labour intensive fabricating operations in Tasmania (Wilde, 1980b).

Thus, the growth performance of the local manufacturing economy is likely to be somewhat different from that of Australian manufacturing overall. Over the period 1972-73 to 1980-81, manufacturing employment in Tasmania as a proportion of the nation's manufacturing labour force remained steady at 2.4 per cent, and the corresponding statistic for value added based on 1980-81 dollars dropped only slightly from 2.6 to 2.5 per cent. Obviously, the Tasmanian manufacturing economy has suffered the same general decline as the nation, with the respective employment rate changes being -13.5 and -13.1 per cent over the period in question (Table A1.9). However, there were marked structural variations. All manufacturing sub-divisions of the Australian economy witnessed decline, principally in the early to mid 1970s, with the greatest adjustment occurring in Textile and Clothing and footwear manufacture. The Tasmanian experience was characterised by greatest declines in these same sub-divisions, yet the declines were relatively greater than for the nation as a whole.

A further notable feature with respect to Tasmania was the absolute and relative growth in the sub-divisions Miscellaneous manufacturing, Fabricated metal products, and, although slight, in the Other industrial machinery and equipment sub-division. Whilst this reflects a tendency towards increasing diversification, these categories employ quite small proportions of the Tasmanian manufacturing labour force and, accordingly, the trend should be viewed with a degree of circumspection.

In addition to these specific features, greatest divergence between the Tasmanian and national structures occurred with respect to Transport equipment, Textiles, Wood, wood products and furniture, and Chemical, petroleum and coal products. These groups were declining at a greater rate in Tasmania than in the nation as a whole, which to some extent may reflect the fact that structural adjustment in manufacturing has only recently begun to gain momentum in the state. Nonetheless, other differentials would seem to indicate an uneven pattern of intra-manufacturing adjustments.

Of particular relevance to the overall economy is the fact that two of the sub-divisions exhibiting high absolute and relative decline (Textiles and Wood, wood products and furniture), are from the subset of five in which there is relative concentration in the Tasmanian manufacturing sector. In the other three areas of specialisation, however, decline in Tasmania was minor (less than 5 per cent of the labour force over the period under review), approximately equal to the national decline in Paper, paper products and printing, and Basic metal products, but considerably lower than the national decline of 14.1 per cent in Food, beverages and tobacco manufacture. Additionally, the adjustments in these three sectors were inconsistent, contrasting with the consistent declines in Textiles and Wood, wood products and furniture. Absolute decline did not eventuate until the late 1970s for Food and beverages, absolute and relative decline in Basic metal products was restricted to the early 1970s, and whilst relative decline was consistent for Paper, paper products and printing, absolute declines occurred in the early 1970s only. Indeed, adjustments tended to be quite uneven and variable overall, suggesting that considerable volatility is a characteristic of the Tasmanian manufacturing structure.

This characteristic has been identified in a shift and share analysis of Australia's regional economies, where Rich (1981) demonstrated that from 1968-69 to 1973-74, the favourable influences resulting from Tasmania's manufacturing structure were heavily offset by poor competitive employment performances, especially in food and basic metal production, largely as a result of instability in international markets and dependence on a relatively limited range of individual commodities (Wilde, 1980 b). In the ensuing period assessed (1974-75 to 1976-77), a reversal occurred which went against the national trend. Relatively unimportant competitive influences were outweighed by, but positively reinforced, a still small proportional (mix) advantage, although these were still insufficient to prevent absolute decline in Tasmanian manufacturing employment (Rich, 1981). Thus, the inherent instability of the character of manufacturing in Tasmania is emphasised.

In terms of value added in manufacturing, only Paper, paper products and printing of the five specialised sub-divisions of manufacturing activity in Tasmania exhibited substantial absolute and relative growth over the period 1972-73 to 1980-81 (Table A1.10). In the other four dominant Tasmanian sub-divisions, no growth and relative decline occurred for Basic metal products manufacture, while Wood, wood products and furniture increased in value added at approximately the same rate as for the nation. Absolute and relative decline occurred for Textile and Food, beverage and tobacco production. Elsewhere, the substantial growth areas of Miscellaneous manufacturing, Fabricated metal products and Other machinery and equipment identified in the employment statistics maintained absolute and relative growth in terms of value added. However, these are of limited overall importance in terms of value added in Tasmanian manufacturing.

Interestingly, Clothing and footwear manufacture witnessed substantial proportional increases in value added over the period compared with national decline, but again, the overall importance to Tasmanian manufacturing is minimal. The remaining sub-divisions were characterised by relative and absolute declines, paralleling the situation for employment.

Thus, a slightly modified picture of structural variation emerges on the basis of value added in manufacturing. Overall, however, declines in value added were more prevalent across the sub-divisions of the Tasmanian economy resulting in a very modest total gain of 2.4 per cent (which began only very recently), compared with a value of 7.5 per cent for the nation as a whole, most of which was also recent, but had started earlier than in Tasmania. This is a further indication of a general lag in the structural adjustment process in some areas of Tasmanian manufacturing. In relation to relative changes in the manufacturing labour force, this seems to reflect a net market loss and thus declining employment, rather than investment in the form of a substitution of capital for labour, in more of Tasmania's manufacturing activity than in Australia overall.

These issues are pursued via an assessment of value added in manufacturing per employee, an index of productivity, over the last decade (Table A1.12). Tasmania and Australia recorded net gains in productivity over the period, although Tasmania is improving at a slower rate which is a reversal of that which occurred in the latter stages of the preceding decade and the early 1970s (Rich, 1981). All manufacturing sub-divisions of the national economy witnessed growth in productivity of at least 15 per cent over the period 1972-73 to 1980-81, greatest in Chemical, petroleum and coal products manufacture and least in Transport equipment. Moreover,

Table 1.12: Productivity in manufacturing, Tasmania and Australia.[1]

Manufacturing sub-division	Tasmania					Australia					Percentage change 1972/73 - 1980/81	
	Productivity ($'000)			Percentage change		Productivity ($'000)			Percentage change			
	1972-73	1977-78	1980-81	1972/73-77/78	1977/78-80/81	1972-73	1977-78	1980-81	1972/73-77/78	1977/78-80/81	Tasmania	Australia
Food, beverages, tobacco	27.0	24.7	24.3	- 8.5	- 1.6	23.6	25.4	28.7	+ 7.6	+13.0	-10.0	+21.6
Textiles	13.6	22.0	19.3	+61.8	-12.3	17.2	20.7	22.1	+20.3	+ 6.8	+41.9	+28.5
Clothing and footwear	7.5	11.4	18.2	+52.0	+59.6	12.4	15.7	16.1	+26.6	+ 2.5	+142.7	+29.8
Wood, wood products and furniture	20.8	24.1	29.0	+15.9	+20.3	17.4	19.7	20.5	+13.2	+ 4.1	+39.4	+17.8
Paper, paper products and printing	20.6	26.7	29.9	+29.6	+12.0	21.2	23.9	25.1	+12.7	+ 5.0	+45.1	+18.4
Chemical, petroleum and coal products	29.1	n.a.	29.6	n.a.	n.a.	33.3	36.2	44.7	+ 8.7	+23.5	+ 1.7	+34.2
Non-metallic mineral products	29.8	23.8	31.5	-20.1	+32.4	26.2	29.4	33.2	+12.2	+12.9	+ 5.7	+26.7
Basic metal products	33.7	29.2	35.2	-13.4	+20.5	26.0	28.3	34.2	+ 8.8	+20.8	+ 4.5	+31.5
Fabricated metal products	16.2	19.2	18.5	+18.5	- 3.6	18.4	21.3	21.7	+15.8	+ 1.9	+14.2	+17.9
Transport equipment	19.8	n.a.	18.9	n.a.	n.a.	17.4	19.8	20.0	+13.8	+ 1.0	- 4.5	+14.9
Other machinery and equipment	13.1	18.2	18.1	+38.9	- 0.5	18.5	21.3	22.4	+15.1	+ 5.2	+38.2	+21.1
Miscellaneous manufacturing	17.6	22.9	24.2	+30.1	+ 5.7	19.4	21.9	23.2	+12.9	+ 5.9	+37.5	+19.6
TOTAL	22.7	25.0	26.9	+10.1	+ 7.6	20.4	23.2	25.2	+13.7	+ 8.6	+18.5	+23.5

n.a. = Not available for publication.

1. Productivity is calculated as value added in manufacturing per employee calculated at 1980-81 dollar values.

Source: Author's calculations based on data in Tables A1.9 and A1.10.

this was greater during the earlier period of greatest economic recession and therefore market contraction. Thus, as noted by Rich, 'declining employment levels appear to be a response to depressed demand, not an accelerated rate of productivity increase' (1981,175).

The Tasmanian experience, on the other hand, was quite variable. Absolute and relative decline occurred for Food, beverages and tobacco, and Transport equipment, and positive gains which were very much lower than the national trend existed for Chemical, petroleum and coal products, Basic metal products and Non-metallic mineral products. Substantial and consistent increases in productivity were recorded for Clothing and footwear which were far in excess of the national average, and other areas of absolute and relative growth were Textiles and Other machinery and equipment (for which the gains were made in the mid 1970s) and Paper, paper products and printing, and Wood, wood products and furniture (where improvement over the decade was more consistent).

In terms of Tasmania's dominant manufacturing sub-divisions, therefore, relative disadvantage *vis-à-vis* Australian manufacturing is restricted to the manufacture of Food and beverages, and Basic metal products which, in the former has been accompanied by small absolute but not relative employment decline, and in the latter by minor absolute and relative employment decline. However, this is in direct contrast to the situation in the late 1960s and early 1970s where these two sub-divisions increased productivity at levels above the national rates (Rich, 1981). Thus, the recent trend would appear not to reflect reduced capital investment, but rather an instability associated with market conditions, and/or individual firm strategies. Indeed, adjustments involving suppressed

operational capacity and/or minor employment shedding appear to have occurred. Moreover, it would appear that perhaps even closures (especially in the Food and beverage sector) are likely in the near future, which will have important repercussions for employment in Tasmania. Interestingly, these are the areas responsible for most non-major metropolitan manufacturing growth in Australia over the last decade (Rich, 1982). Clearly, Tasmania is failing to participate in this trend. Thus, Tasmania is

> a good example of the impact of high levels of capital investment in a small economy producing (often part-processed) commodities for export having relatively little benefit to its employment levels or to the economy more generally (Rich, 1981, 181).

The other major sub-divisions of the Tasmanian manufacturing economy, particularly the forest based manufacturers, appear to have consolidated after the depths of the depression, and this occurred with relatively high employment loss in the manufacture of Wood, wood products and furniture, but little in Paper, paper products and printing. However, the overall gain in productivity in Textiles (at substantial employment loss and accompanied by considerable capital investment in some cases) was a feature of the mid 1970s only. Very recent absolute and relative productivity declines in Textiles emphasise the continuing instability in the Tasmanian manufacturing structure.

Thus, specialisation in the overall industrial structure of the Tasmanian economy is paralleled by specialisation in the manufacturing sector, both largely based on natural resources, and the losses from structural adjustment are common to each. Furthermore, the major area in

which Tasmania has been the recipient of 'filtered down' manufacturing, Textiles, has borne the greatest brunt of these negative changes. Clearly, Tasmania's narrowly based, peripheral economy is particularly susceptible to the adverse effects of national trends and international market volatility. Moreover, it would appear that these adjustments are still continuing in some areas of the local economy.

In addition to the implications for Tasmania arising from the narrowness of its economic base and its vulnerability to changing economic circumstances culminating in these effects of structural adjustment, the impact on specific local communities within the state is particularly severe. The dispersal of the Tasmanian population and associated infrastructure, and the widely distributed natural resource base coupled with the tendency for the capital intensive extractive and processing industries to be dominated by large undertakings, has resulted in a large proportion of the employment in individual labour markets being dominated by one or very few large enterprises.

The most extreme examples are the northern township of George Town (population 5,592 in 1981), and the west coast town of Queenstown (population 3,714 in 1981).[4] George Town's labour force is dominated by two large basic metal products manufacturers, and 47.3 per cent of the local labour force was employed in that manufacturing sub-division in 1981. Queenstown is dominated by one large mining company, and in 1981,

---

4 The location of these urban centres is indicated in Figure A1.2 and/or Figure A1.3.

41.6 per cent of the Queenstown labour force was employed in mining. Other less extreme examples exist such as the north west coast major town of Burnie (population 20,368 in 1981), where 16.5 per cent of the local labour force was employed in the manufacturing sub-division Paper, paper products and printing, most of which was accounted for by the one major pulp and paper manufacturer (A.B.S., unpublished data, 1981).

Clearly, technological and organisational adjustments, and the vagaries of international markets for the products of such firms, have very important social implications for the host communities when retrenchments result, a factor recognised by Wilde (1977) and Rich (1981). Even the larger centres suffer these consequences. Structural adjustment in the textile industry had severe repercussions for Launceston, resulting in some 1,500 retrenchments over the period June 1974 to December 1976 (Tasmanian Yearbook, 1977). Given the narrowness of the state's economy generally, and the even greater specialisation in the regional communities, the opportunities for re-employment are virtually non-existent, thereby adding to Tasmania's universally poor standing with respect to some of the basic indicators of economic health referred to earlier (Refer Section A1.1.1).

It has become increasingly clear from these analyses, therefore, that in addition to the impact of national trends, the character of the Tasmanian economy is such that the state has very little control over its destiny, with many of its problems the result of global market adjustments for semi-processed commodities, and the development and marketing strategies of multi-locational firms controlled from outside Tasmania. Thus, a lack of local independence is a crucial factor in Tasmanian industrial development.

A1.1.2.5 Independence of the Tasmanian economy.

As already indicated, the opportunities for large scale production are restricted to primary and related processed products that are competitive in national and international markets. The exports are principally mineral ores and concentrates, refined zinc and aluminium, woodchips, timber, pulp and paper, and agricultural produce (Table A1.13).

Table A1.13: Interstate and overseas export of principal commodities, Tasmania 1980-81.

Commodity	Value ($ million)	%	Commodity	Value ($ million)	%
Ores and concentrates	221.2	15.1	Fruit	17.3	1.2
Refined metals[1]	138.1	9.4	Live animals	14.8	1.0
Timber	85.3	5.8	Machinery	10.7	0.7
Vegetables, fresh and preserved	67.6	4.6	Hides and skins	6.6	0.5
Wool, greasy	48.4	3.3	Hops	4.0	0.3
Textile yarn, fabrics, made up textiles	45.0	3.1	Tallow	3.1	0.2
Meat	35.9	2.5	Commodities not available for publication[2]	638.8	43.6
Fish and shellfish	25.2	1.7	Other	77.9	5.3
Cheese and butter	25.1	1.7			
			TOTAL	1,465.1	100

1. Principally zinc ($135.3 million).

2. Commodities comprising this item are: aluminium, alumina, beadings and mouldings, paper, hard-board, cement, ferro-manganese, silicon-manganese, confectionery, cocoa and chocolate, food beverages, paper pulp, metal scrap, calcium carbide, titanium oxides, plywood, rutile, zirconium, particle board, asbestos-cement articles, ferro-silicon and woodchips.

Source: A.B.S., Tasmanian Yearbook, 1983.

Moreover, this narrow export specialisation is combined with a limited range of overseas markets, mainly Japan, the Association of South East Asian Nations, the European Economic Community and the United States of America (Table A1.14). Because of this narrowness, the extreme volatility of international commodity prices, and changing economic alliances, the Tasmanian economy is particularly vulnerable (Wilde, 1980b),

much more so than that of the nation as a whole, as trends of the last decade and a half attest. For example, Britain's entry into the European Economic Community had severe repercussions for Tasmanian overseas trade. From Tasmania's industrial beginnings up to 1967-68, the United Kingdom was the state's principal overseas market, accounting for 26.3 per cent of overseas exports in that latter year. Since then this proportion has declined dramatically to only 2.5 per cent in 1980-81, with Japan taking over as the major international importer of Tasmanian products from 1968-69. Thus, the Tasmanian economy is very dependent upon international economic trends and decision making.

Table A1.14: Export trade with overseas countries, Tasmania 1980-81.

Country of destination	Value of trade	
	($million)	%
Japan	255.6	38.8
ASEAN[1]	144.8	22.0
European Economic Community[2]	81.3	12.4
United States of America	66.1	10.0
Hong Kong	24.1	3.7
Taiwan	16.5	2.5
U.S.S.R.	16.3	2.5
New Zealand	11.3	1.7
Other	42.1	6.4
TOTAL	658.0[3]	100

1. Association of South East Asian Nations.
2. Exports to the United Kingdom valued $16.4 million (2.5 per cent).
3. 3.43 per cent of Australia's total value of exports.

Source: A.B.S., Tasmanian Yearbook, 1983.

Furthermore, the very nature of the Tasmanian situation and the fact that its resource base is such that substantial capital investment is necessary, means that the economy is dominated by a few very large operations for which decisions are made outside the state. Wilde (1980b)

has demonstrated that in 1975-76, six manufacturing establishments employing over 500 workers (0.9 per cent of all Tasmanian establishments), accounted for 26.9 per cent of Tasmania's manufacturing labour force, and of those employing over 100 workers, 61 (9.1 per cent of all establishments) accounted for 65.6 per cent of the state's manufacturing workers (Table A1.15).

Table A1.15: Employment in large manufacturing establishments in the Australian states, 1975-76.

State	Establishments employing over 500 workers				Establishments employing over 100 workers			
	Establishments		Employees		Establishments		Employees	
	No.	Percentage of total	No.	Percentage of total	No.	Percentage of total	No.	Percentage of total
Tasmania	6	0.90	7,473	26.9	61	9.1	18,199	65.6
New South Wales	104	1.01	128,373	28.3	844	8.2	278,429	61.4
Victoria	102	1.15	108,620	26.0	852	9.6	256,817	61.5
Queensland	28	0.90	23,445	20.5	246	7.9	69,168	60.6
South Australia	31	1.38	42,097	36.6	221	9.9	78,352	68.0
Western Australia	13	0.63	13,091	19.8	130	6.3	34,799	52.8
Total for all states	284	1.02	323,099	27.1	2,354	8.5	735,764	61.6

Derived from unpublished manufacturing census data, A.B.S., 1975-76.

Source: Wilde, 1980b, 13.

With respect to the Australia wide pattern, the relative proportions of all firms in these larger categories, and the relative proportions of the labour force employed by them, do not diverge greatly from state to state. Nevertheless, a situation in which six large firms involved in a limited range of industrial undertakings control 26.9 per cent of the Tasmanian labour force, as opposed to 104 such firms involved in a greater range of activities controlling 28.3 per cent of the New South Wales labour force, emphasises the concentration of decision making and the state's inherent vulnerability. The situation is even more pronounced in the mining

industry in Tasmania where five companies control about 85 per cent of the workforce (Wilde, 1980b). Thus,

> in Tasmania's small specialised and capital-intensive economy individual firms have a major impact on the functional and occupational structure and on the growth potential of the state (Wilde, 1980b, 2).

Of even greater importance than the concentration of decision making is the fact that the decisions are generally made outside Tasmania, principally in Melbourne and Sydney. In the mining sector only 13 per cent of the state's labour force was locally controlled in 1975, and in manufacturing only 44 per cent (Table A1.16). Also important is the extent to which Transport and commercial (Finance, property and business) services in Tasmania are provided by firms controlled from mainland Australia.

When the manufacturing sector is broken down by industry sub-division, the magnitude of this outside control over Tasmania's economic base is further emphasised. In four of the five dominant manufacturing sub-divisions *viz.* Basic metal products, Textiles, Food beverages and tobacco and Paper, paper products and printing, at least 49 per cent of the labour force is controlled from outside Tasmania (Table A1.17), and an increasing shift of control to the national core is a key characteristic of current industrial change in Australia (Rich, 1982). In only Wood, wood products and furniture of the dominant sub-divisions is there substantial local control.

The Tasmanian situation, therefore, is one in which the economy is dominated by a few large operations which are part of multi-locational organisations, and for which decisions are made in an environment totally

Table A1.16: Tasmanian employment by location of controlling head office, all economic activity, February 1975.[1,2]

Industry division	Percentage of total Tasmanian employment			
	Tasmania	Victoria	N.S.W.	Other states & territories
Mining	13	25	62	0
Manufacturing	44	45	10	1
Transport and storage, communication.[3]	47	49	3	1
Finance etc[3,4]	52	19	28	1
Wholesale and retail trade	78	14	8	1
Construction[3]	82	16	2	0
Entertainment etc[3,5]	88	n.a.	n.a.	n.a.
Community services[3]	94	n.a.	n.a.	n.a.
Electricity, gas and water	n.a.	0	n.a.	0
All industry[6]	68	22	9	1

n.a. = Not available for publication.
1. Includes employers and self-employed persons.
2. Head office in legal control of respective establishment(s) is located in Tasmania.
3. Less reliable data due to economic census and integrated register variations in coverage and timing of updates to the register.
4. Finance, insurance, real estate and business services.
5. Entertainment, recreation, restaurants, hotels and personal services.
6. Includes agriculture, forestry, fishing and hunting; and public administration and defence (for which separate details are not shown).

Source: A.B.S., Tasmanian Yearbook, 1976, p.405

divorced from, and not necessarily in the best interests of, the peripheral local economy. Indeed, the power networks within the segmented economy are replicated within the organisation. The large business organisation is made up of central and peripheral units, and its 'behaviour is the result of the need to continually redefine its centre and periphery to retain competitive contact with other large business organisations' (Taylor and Thrift, 1982c, 1607). Thus, in addition to the obvious impact the lack of administrative

Table A1.17: Tasmanian employment by location of controlling head office, manufacturing establishments, February 1975.[1,2]

Manufacturing sub-division	Percentage of total Tasmanian employment			
	Tasmania	Victoria	N.S.W.	Other states & territories
Basic metal products	6	90	4	0
Textiles	16	25	58	0
Food, beverage and tobacco	44	52	n.a.	n.a.
Fabricated metal products	46	50	4	0
Transport equipment	52	48	0	0
Paper and paper products, printing	51	48	1	0
Chemical, petroleum and coal products	54	43	3	0
Non-metallic mineral products	58	27	15	0
Other machinery and equipment	62	n.a.	n.a.	n.a.
Wood, wood products and furniture	70	27	n.a.	n.a.
Miscellaneous manufacturing	72	15	n.a.	n.a.
Clothing and footwear	98	2	0	0
Total manufacturing	44	45	10	1

n.a. - Not available for publication.
1. Includes employers and self-employed persons.
2. Head office in legal control of respective establishment(s) located in Tasmania.

Source: A.B.S., Tasmanian yearbook, 1976, p.406.

and executive functions already has on the local occupational and employment structure, decisions which are made in the best interests of the firm are likely to operate to an increasingly detrimental effect on the Tasmanian economy because the locational advantages offered by the state are contracting as the national economy evolves.

Overall, therefore, the Tasmanian economy relative to mainland Australia is characterised by:

(i) a small, regionally dispersed local market;

(ii) transport problems in servicing external markets;

(iii) local inadequacy or non-availability of some high order services and facilities;

(iv) reduced efficiency and competitive ability due to limited access to technological innovation and sophisticated information networks;

(v) specialisation in activities related to the natural resource base with an emphasis on preliminary processing only;

(vi) export income derived from a narrow range of products destined for fluctuating external markets;

(vii) the losses, but not the gains, from processes of structural adjustment within the national industrial structure, with often unpredictable adjustments in the productive sectors; and

(vii) a domination by relatively few large operations with head offices located elsewhere.

None of these problems are of recent origin, however. From earliest times, the Tasmanian industrial system has been beset by regional and structural disadvantages that have militated against strong industrial development. In the period up to 1850, Tasmania was economically backward relative to Australia.

> The emphasis was on processing primary produce and supplying day-to-day consumer goods. The limited local market, the shortage and high cost of skilled labour, and the more immediate rewards available from sheep farming and commerce, all hindered the pace of industrial growth. Moreover, apart from timber the island had few natural resources on which to base manufacturing, although advantage was taken of the cooler climate to grow hops and brew beer for export to the mainland, and the tanners and curriers processed kangaroo skins for Sydney footwear firms. The only industries to develop on any scale were shipbuilding and flour-milling (Linge, 1975, 154).

Nor did the succeeding period of rapid growth in Australian industry (1851-1890) witness a noticeable change in relativities.

> Throughout this period Tasmania remained something of an economic backwater. The slow growth of population and its limited natural resources retarded development while its dependence on the export of a few commodities made it particularly susceptible to external changes in market conditions over which it had little or no control. It was the only colony, too, in which the capital city was challenged for industrial supremacy, a contemporary view reinforced in 1887 when Tasmania's first Chamber of Manufactures was established at Launceston. This continuing division of the colony's limited economic resources between two centres - neither of which had grown to anything like the size even of Ballarat in Victoria or Newcastle in New South Wales - may also have retarded industrial development (Linge, 1975, 171).

Thus, below average performance on the basic indicators of economic health of the state's population are entirely consistent with Tasmania's isolated, peripheral location, and the structure of its economy. The interplay of all of these features demonstrates beyond doubt that Tasmania may be classified as an economically depressed region. Future growth arising from its natural resource base appears unlikely. The traditional advantages offered potential investors in the state of relatively cheap hydro electric power, a stable workforce and the availability of fresh water and cheap land are not sufficient. Factors such as the availability

of a fully developed infrastructure, a complete range of professional and technical services, commercial leadership, an efficient communication and information network, close proximity to benefit from material linkage economies, and ready access to a market and a labour force possessing a range of skills, are crucial in contemporary industrialisation, and work towards the concentration of activity in the nodal areas at the expense of peripheral regions such as Tasmania.

Indeed, within the global system, Tasmania is peripheral to the Australian core, (Melbourne and Sydney), which itself is peripheral to the international industrial system (Wilde, 1980a; Taylor and Thrift, 1981b). Moreover, recent trends seem to indicate that Tasmania is in a subordinate position even to that of the mainland Australian peripheral areas since it is not participating in one notable contemporary change to the Australian space economy. That is, an increasing dispersal of manufacturing, and its growth in the periphery, especially as a result of accelerated developments in the manufacture of Food, beverages and tobacco, and Basic metal products in non-core regions. This has become the major source of growth in the peripheral areas, rather than the establishment of branch plants designed to cater to dispersed markets which had earlier supported regional industrial development (Rich, 1982).

Thus, the future for Tasmania is industrial stagnation and relative decline with considerable fluctuation at best, but further absolute decline is likely. With the increasing concentration of most manufacturing activities due to high technology, rapid innovation and decreasing product cycle, environments such as Tasmania are effectively 'puppets on a string' within the national and international economic community, and are really

only left with natural resources and localised, low threshold demand oriented manufacturing opportunities only, a conclusion shared by Linge (1983).

This then, is the climate in which the Launceston manufacturing economy operates. Prior to assessing the development of manufacturing in Launceston, however, it is necessary to investigate Launceston's role within the regional economic structure of Tasmania.

A1.2 Launceston: a peripherally located provincial service centre.

Launceston is sited at the headwaters of the Tamar river formed by the confluence of the North Esk and South Esk rivers in northern Tasmania (Figure A1.3). The first settlement along the Tamar occurred in 1804 at what is now known as George Town, and before the end of that year moves were in progress to develop a settlement up river at the present Launceston site, thereby establishing Launceston as the third oldest city in Australia.[5] In 1806 Launceston was designated the principal centre of the north and the official residence for the Lieutenant Governor of the Northern Territory of Tasmania, the two territories being delineated by latitude 42 degrees South. This northern independence was short lived, however, since the position of Lieutenant Governor of the northern region was not reinstated with the departure of the original incumbent in 1809. Accordingly, administrative control for all of Tasmania gradually gravitated to Hobart, ultimately contributing to considerable antagonism between the two communities, vestiges of which are still present.

---

5 The key source used for this historical information is Reynolds, 1969.

Moreover, the first 20 years of settlement witnessed little progress at Launceston because of vacillation concerning the most appropriate site for the principal city for northern Tasmania, either down river closer to Bass Strait at George Town, or up river at Launceston. The decision which permanently established the headquarters at Launceston was made in 1824, and the transfer was effected by the following year. In 1888, Launceston recorded a population of 17,000 persons and was at that stage proclaimed a city (Tasmanian Yearbook, 1983).

A1.2.1 Launceston's status within the regional economic structure of Tasmania.

Since 1825, Launceston has functioned as the principal city of northern Tasmania. Today, the city is the economic and social hub of the Launceston statistical district, which extends along the Tamar Valley from George Town in the north to just south of Launceston, and incorporates the smaller rural/dormitory towns of Hadspen, Longford, Perth and Evandale (Figure A1.3). The Launceston statistical district, which had a population of 86,810 persons in 1981, forms a substantial regional labour market. This district is the core, not only of the immediate rural hinterland of the Tamar statistical sub-division, but of the entire Northern division (Refer Figure A1.2). As indicated in Section A1.1.2.2, these statistical division boundaries parallel, by design, the regional boundaries,[6] and the Northern region derives its economic identity principally from its agricultural and forestry resources. Launceston serves as the principal service

---

6 These boundaries correspond with local planning region boundaries (Urban Design and Planning Associates, 1971; Tamar Regional Master Planning Authority, 1979).

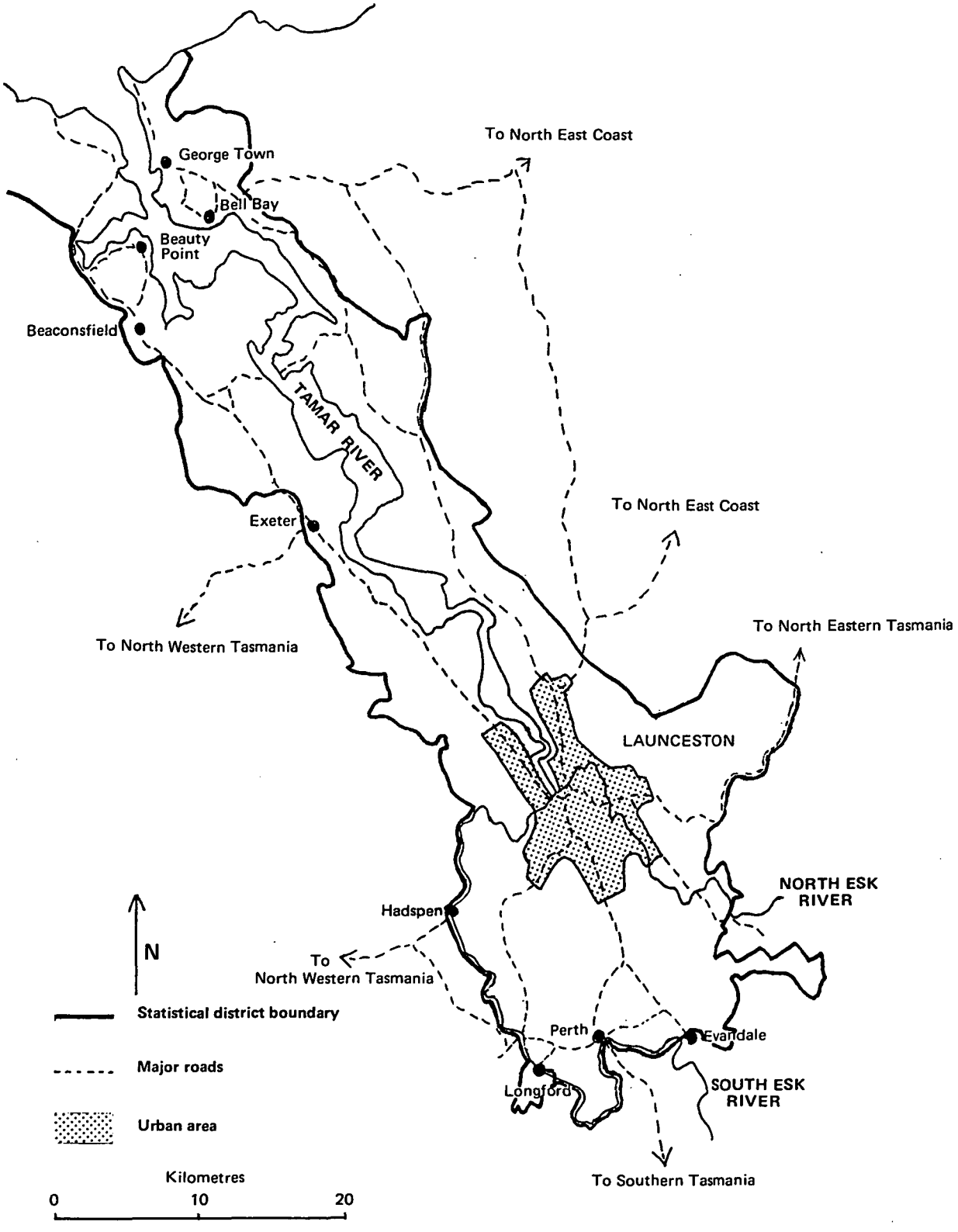


Figure A1.3: The Launceston statistical district.

centre for this region, and is particularly important as an employment node within the Tamar sub-division. Its sphere of influence in the provision of goods and services is primarily north eastern Tasmania and the northern midlands, although this influence does extend to north western Tasmania (Scott, 1964).

In the establishment of an urban hierarchy for Tasmania based on function, it was found that whilst Hobart stood supreme as the state capital, Launceston duplicated in northern Tasmania many of Hobart's metropolitan functions, sharing many retail, cultural, governmental and judicial functions not generally found in such major towns. In fact, Launceston assumed some metropolitan functions for centres beyond the northern regional area, to the north west of the state, with Burnie and Devonport being dependent on Launceston (or alternatively Melbourne or Hobart) for some characteristic city functions such as high order specialist medical, retail and educational services (Scott, 1964). Launceston has continued to fulfil this role.

Thus, Launceston occupies a somewhat atypical position in the national context. The lack of capital city primacy in Tasmania has resulted in both Hobart and Launceston duplicating many higher order regional service functions, even though Hobart does reign supreme in state administrative functions. This higher order service centre role thrust upon Launceston is not evident in mainland centres of equivalent population size such as Ballarat and Bendigo, although for second order centres within the state systems such as Geelong and Newcastle, and isolated sub-regional cores such as Townsville, functional similarities exist.

The dispersed nature of the Tasmanian population has received earlier attention, as has the relatively sluggish population growth pattern for the state. In terms of regional variations in growth, the most marked changes have occurred in the northern half of the state (Table A1.18). Launceston and the Northern region have exhibited a slight decline in their proportion of the total Tasmanian population over the last 20 years, particularly in the decade 1961-71 for the region as a whole where the average annual growth was only 0.39 per cent. The proportion of the Tasmanian population in the Northern region has stabilised to approximately 27 per cent in the last decade, with a growth rate currently marginally greater than that of the state overall.

This situation has been mirrored by an increasing proportion of the Tasmanian population in the North Western and Western region. Here the greatest growth occurred in the period 1961-71 as a result of marked manufacturing and agricultural expansion in the North West (average annual population growth of 1.82 per cent 1961-71), and expansion in mining activities on the West Coast (average annual population growth of 2.94 per cent 1961-71). Since that time, however, population growth in both the North Western and Western areas of Tasmania has been slightly below the state average. Meanwhile, little change occurred in the Southern region, where the proportion of the total population has remained at approximately 47 per cent for the last 20 years, with growth rates close to those for the state as a whole.

This pattern is largely a reflection of the longer establishment of the Northern and Southern regions as industrial centres, with the more

Table A1.18: Population distribution and growth by region, Tasmania.

Region	Regional population (%)[1]					Average annual growth[2]	
	1961	1966	1971	1976	1981	1961-1971	1971-1981
Southern	46.9	47.0	46.9	47.3	47.2	1.09	0.71
Northern	29.4	28.6	27.4	27.2	27.4	0.39	0.77
North Western and Western	23.5	24.3	25.6	25.3	25.3	1.95	0.61
TASMANIA[3]	100	100	100	100	100	1.08	0.71
Urban Hobart	33.1	32.2	33.3	32.4	30.7	1.15	-0.10
Urban Launceston	16.2	16.3	16.0	15.6	15.4	0.93	0.37
Urban Burnie	4.6	4.9	5.1	4.7	4.9	2.31	0.14
Urban Devonport	3.7	4.0	4.7	4.8	5.1	3.36	1.65

1. Based on actual census counts to maintain consistency across the time series and for the urban populations.
2. Annual rate of increase = $(\sqrt[t]{\frac{P_1}{P_0}} - 1) \times 100$

   P_0 = population at beginning of period. P_1 = population at end of period.

   t = number of years.
3. The Tasmanian total includes a small proportion recorded as migratory, a maximum of 0.25 per cent in 1961.

Source: A.B.S., Census of Population and Housing, 1961, 1966, 1971, 1976, 1981.

recent expansion of industrial activity in the North-West leading to minor distributional changes at the expense of the Northern region. An Economic Research Unit Report (1975) indicated that during the early to mid 1960s, the Northern region was experiencing limited growth in its labour force largely as a result of an industrial mix characterised by activities which had declining shares of the respective state industrial totals. Nonetheless, there was developing an increasing similarity in the industrial structure of the three regions over this time, each exhibiting a change in emphasis from the traditional resource based activities to manufacturing and tertiary employment. A pattern developed over this period whereby regional concentration tended to be highest in the agricultural and mining industries, reflecting the resource influence on locational patterns. Most manufacturing and tertiary activities tended to be regionally dispersed, with no substantial locational preference for any of the three regions (Economic Research Unit, 1975, 32-34).

The trend to manufacturing and tertiary sector employment in the 1960s was reflected in the higher growth rates experienced by the major urban centres (Table A1.18). Thus, urbanisation was an important element of the changing distributional pattern of the Tasmanian population in that period, with greatest growth occurring in the North Western Tasmanian major towns of Burnie and Devonport (average annual growth rates of 2.31 and 3.36 per cent respectively for 1961-71). Since then the drift to the major centres has subsided dramatically, with relative decline in most centres. Only Devonport witnessed substantial gains over the last decade (average annual growth of 1.65 per cent 1971-81). Nonetheless, statistical areas based on the major centres (broadly reflecting urban labour markets) did not experience decline to the extent the actual contiguous built up areas of each of these centres did. Indeed, growth rates are now marginally above the state average (0.59 per cent for the Launceston Statistical District and 0.69 per cent for the Hobart Statistical Division over the period 1976-81 compared with 0.56 per cent for Tasmania as a whole).[7] Thus, there has been little change in the overall regional distribution of the Tasmanian population over the last decade.

Likewise, the industrial structures of the regional labour forces have witnessed minimal shifts in regional specialisation (Tables A1.19 and A1.20). Growth rates in the labour force over the period 1971-81 were 13.0, 11.7 and 14.0 per cent for the Northern, North Western and Western, and Southern regions respectively which, by 1981, represented 27.3, 25.0 and

---

7 The Launceston Statistical District was first defined at the 1976 census and the Burnie-Devonport Statistical District was not defined until the 1981 census.

47.5 per cent of the state's total employed population. However, there were no major variations in the overall industrial structure of each except for an increase in the relative concentration of employment in the Communications sector in the Southern region from 1976, and a quite dramatic absolute and relative increase in Electricity, gas and water employment in the North Western and Western region in 1981. The latter was due entirely to the initiation of hydro-electric power developments on the West coast of Tasmania in the late 1970s.

The regional specialisation (relative concentration) that does occur exists to the extent that capital city dominance is reflected in the industrial structure of the Southern region labour force. This specialisation occurs consistently in the Public administration and defence, Electricity, gas and water, and Finance, property and business services industries, with the more recent specialisation in Communications. Least specialisation occurs in the Mining, Agriculture, forestry, fishing, and the Manufacturing industries. Clearly, there is a dominance of the state oriented administrative and service activities in Southern Tasmania. In the North Western and Western region there is a very high specialisation overall in Mining, plus Agriculture, forestry and fishing, and Manufacturing, with the recent upsurge in Electricity, gas and water activities. Within this region there is further specialisation, however. The Western sub-region is essentially a mining area with 43.0 per cent of the 1981 labour force employed in that sector, and it is in this sub-region that the recent influx of electricity workers now operate (14.8 per cent of the labour force in 1981). In the North Western sub-region there is a relative concentration in Agriculture, forestry and fishing, and

Table A1.19: Regional employment by industry, Tasmania.

Industry division.[1]	Employed population (%)[2]															
	Southern				Northern				North Western and Western				Tasmania[3]			
	1971	1976	1981	% Change 1971-81	1971	1976	1981	% Change 1971-81	1971	1976	1981	% Change 1971-81	1971	1976	1981	% Change 1971-81
Agriculture, forestry, fishing and hunting.	6.7	5.1	5.4	- 8.2	11.4	10.3	9.8	- 2.7	11.4	10.3	9.6	- 6.2	9.2	7.8	7.6	- 5.6
Mining	0.2	0.3	0.2	-10.9	1.6	0.9	1.2	-13.3	9.9	8.9	8.4	- 4.3	3.0	2.6	2.5	- 5.9
Manufacturing	18.7	14.0	12.6	-23.4	23.7	19.5	17.9	-14.7	22.4	19.9	18.0	-10.3	21.0	16.9	15.3	-17.2
Electricity, gas and water	3.5	2.8	3.3	+ 5.3	1.5	1.4	1.3	- 4.9	1.4	0.8	3.3	+156.7	2.5	1.9	2.7	+26.0
Construction	9.1	7.8	6.9	-14.1	7.4	7.3	6.6	+ 1.5	8.9	8.0	5.4	-32.0	8.6	7.7	6.4	-15.1
Wholesale and retail trade	17.9	17.4	16.9	+ 7.6	19.7	19.4	18.6	+ 6.5	16.5	16.9	15.8	+ 7.5	18.0	17.8	17.1	+ 7.2
Transport and storage	4.7	4.6	4.1	- 1.0	5.3	5.1	5.6	+21.3	5.4	4.9	4.6	- 5.9	5.1	5.0	4.8	+ 7.4
Communications	2.5	3.4	2.6	+15.4	2.0	1.8	1.6	- 9.2	1.6	1.1	1.3	- 7.0	2.2	1.9	2.0	+ 5.1
Finance, property and business services.	6.6	7.5	7.8	+35.5	4.8	5.4	5.6	+32.9	3.1	3.9	4.3	+53.3	5.2	6.0	6.3	+37.5
Public administration and defence	7.1	7.1	7.4	+18.3	3.0	3.1	3.6	+34.3	2.4	1.8	2.8	+31.0	4.8	4.7	5.2	+22.7
Community services	13.7	17.3	19.8	+65.0	11.2	13.7	16.5	+66.3	9.0	11.9	13.9	+72.5	11.8	15.0	17.4	+66.8
Recreational, personal and other services.	5.8	7.1	7.2	+42.2	4.8	5.1	5.3	+25.0	4.1	4.1	4.5	+23.8	5.1	5.8	6.0	+34.0
Other and not stated	3.4	6.7	5.9	+99.5	3.6	7.1	6.3	+97.2	3.9	7.4	8.0	+129.2	3.6	7.0	6.6	+110.2
TOTAL[3]	100	100	100	+14.0	100	100	100	+13.0	100	100	100	+11.7	100	100	100	+13.4
No. employed ('000)[3]	71.0	79.1	80.9		41.1	44.3	46.5		38.1	40.0	42.6		150.2	163.9	170.4	

1. 1971 and 1976 data based on A.S.I.C. (1969). 1981 data based on A.S.I.C. (1978). The impact of the revision was minimal at the A.S.I.C. division level.

2. Based on data as recorded at the census.

3. Tasmanian figures include a migratory component of the employed population in 1976 (0.3 per cent) and in 1981 (0.26 per cent).

Source: A.B.S., Census of Population and Housing, 1971, 1976, 1981. Author's calculations

Table A1.20: Regional specialisation of employment relative to Tasmania.

Industry division[1]	Location Quotient (L.Q.)								
	Southern			Northern			North Western and Western		
	1971	1976	1981	1971	1976	1981	1971	1976	1981
Agriculture, forestry, fishing and hunting.	0.728	0.654	0.711	1.239	1.321	1.289	1.239	1.321	1.263
Mining	0.067	0.115	0.080	0.533	0.346	0.480	3.300	3.423	3.360
Manufacturing	0.890	0.828	0.824	1.129	1.154	1.170	1.067	1.178	1.176
Electricity, gas and water	1.400	1.474	1.222	0.600	0.737	0.481	0.560	0.421	1.222
Construction	1.058	1.013	1.078	0.860	0.948	1.031	1.035	1.039	0.844
Wholesale and retail trade	0.994	0.978	0.988	1.094	1.090	1.088	0.917	0.949	0.924
Transport and storage	0.922	0.920	0.854	1.039	1.020	1.167	1.059	0.980	0.958
Communications	1.136	1.789	1.300	0.909	0.947	0.800	0.727	0.579	0.650
Finance, property and business services	1.269	1.250	1.238	0.923	0.900	0.889	0.596	0.650	0.683
Public administration and defence	1.479	1.511	1.423	0.625	0.660	0.692	0.500	0.383	0.538
Community services	1.161	1.153	1.138	0.949	0.913	0.948	0.763	0.793	0.799
Recreational, personal and other services	1.137	1.224	1.200	0.941	0.879	0.833	0.804	0.707	0.750
Other and not stated	0.944	0.957	0.894	1.000	1.014	0.955	1.083	1.057	1.212

1. Refer footnotes 1 and 2 of Table A1.19

2. L.Q. = $\frac{\text{Employment in industry x in Region}}{\text{Total employment in Region}} \div \frac{\text{Employment in industry x in Tasmania}}{\text{Total employment in Tasmania}}$

L.Q. > 1 = over-represented. L.Q. < 1 = under-represented. L.Q. =1 = equal share.

Source: A.B.S. Census of Population and Housing, 1971, 1976, 1981.
Author's calculations.

Manufacturing, which employed 11.2 and 21.0 per cent respectively of the North Western labour force in 1981. Least specialisation in both areas exists in the administrative - commercial services areas of Public administration and defence, and Finance, property and business services.

The pattern in the Northern region is somewhat similar to that of the North Western sub-region in that they both exhibit a dominance in the Agriculture, forestry and fishing, and Manufacturing industries relative to their population base. Beyond this, however, there is a specialisation in the Northern region in Wholesale and retail activity, and recently in Transport and storage, together with proportions in the Communications and

Finance related industries greater than expected for a non-capital city region. The categories exhibiting least specialisation in the Northern region are Mining, plus the state based services of Electricity, gas and water, and Public administration and defence. This pattern reinforces the provincial service role of Launceston in the Northern region and beyond.

Such a role is confirmed by a comparison of the urban core of the Northern region, the Launceston Statistical District, with its equivalent in the Southern region (Table A1.21). This serves to highlight the essentially overlapping character of the two centres, both providing a regional service function, but with Hobart pre-eminent in the provision of those administrative and service needs organised on a statewide basis. This is compensated in Launceston by a relatively larger Manufacturing, Wholesaling/retailing and Transport and storage component. Thus, Launceston has developed as a commercial centre whilst government service is centred in Hobart. Launceston is an important distribution centre for one third to one half of the state, and because of its position appears to be evolving as the major distribution centre for the whole of Tasmania.

It is also clear that manufacturing is an integral component of the economic activity of the Northern region, and of the Launceston area in particular. This high incidence of manufacturing around Launceston relative to its population base is largely a response to the natural resource base of the region, to Launceston's proximity to mainland Australia, and to its locational centrality in the state, especially in respect to its very adequate transport infrastructure.

Table A1.21: Employment specialisation in statistical areas centred on Hobart and Launceston, 1981.

Industry division[1]	Hobart Statistical District			Launceston Statistical District			Tasmania	
	No.	%	L.Q.[1]	No.	%	L.Q.[1]	No.	%
Agriculture, forestry, fishing and hunting	1,046	1.5	0.197	887	2.6	0.342	12,995	7.6
Mining	134	0.2	0.080	143	0.4	0.160	4,311	2.5
Manufacturing	9,007	13.0	0.850	6,909	20.1	1.314	26,124	15.3
Electricity, gas and water	2,136	3.1	1.148	406	1.2	0.444	4,641	2.7
Construction	4,919	7.1	1.109	2,470	7.2	1.125	10,963	6.4
Wholesale and retail trade	12,446	17.9	1.047	7,153	20.8	1.216	29,078	17.1
Transport and storage	2,828	4.1	0.854	2,105	6.1	1.271	8,156	4.8
Communications	1,912	2.8	1.400	600	1.7	0.850	3,401	2.0
Finance, property and business services	5,998	8.6	1.365	2,313	6.7	1.063	10,758	6.3
Public administration and defence	5,522	8.0	1.538	1,308	3.8	0.731	8,846	5.2
Community services	14,541	20.9	1.201	6,236	18.1	1.040	29,617	17.4
Recreational, personal and other services	5,171	7.4	1.233	1,937	5.6	0.933	10,209	6.0
Other and not stated	3,771	5.4	0.818	1,916	5.6	0.848	11,301	6.6
TOTAL	69,431	100		34,389	100		170,402	100

1. Refer footnotes 1 and 2 of Table A1.20

Source: A.B.S., Census of Population and Housing, 1981.
Author's calculations.

Clearly, such a provincial node will always develop a manufacturing component based on the natural resources of the hinterland. In this case the region is characterised by patterns of climate and soil amenable to a variety of farming activities, and a wide distribution of sclerophyll forests. Accordingly, production in the food processing and forest based industries is important to Launceston, and to the region generally via some decentralised activity. Additionally, the local concentration of population creates a demand for a whole host of consumer goods and specialist order goods, the production of which contributes to the manufacturing economy.

This is extended further in the case of Launceston, however, since its position midway between the other populated areas of the state (the North West and the South), and proximity to Melbourne, provide an ideal

location for late stage fabricative, consumer oriented manufacturing serving the entire state market. This parallels the increasingly important distributive function already evident. Launceston is connected to each of the major centres by a road and rail network which facilitate the ready procurement and/or distribution of goods to any part of Tasmania (Figures A1.4 and A1.5). Furthermore, a major airport and sea port provide Launceston with ready access to mainland Australian and international sources and markets (Figure A1.5). This aspect of centrality to the state and ready acces to the rest of Australia and overseas,[8] has provided Launceston with a distinct locational advantage which has assisted in the evolution of a greater than proportional share of the Tasmanian labour force in the manufacturing sector.[9] Indeed, a total of 62 firms (35.4 per cent) surveyed within the urban area in 1980 cited this aspect as one of their major advantages of being located in Launceston.

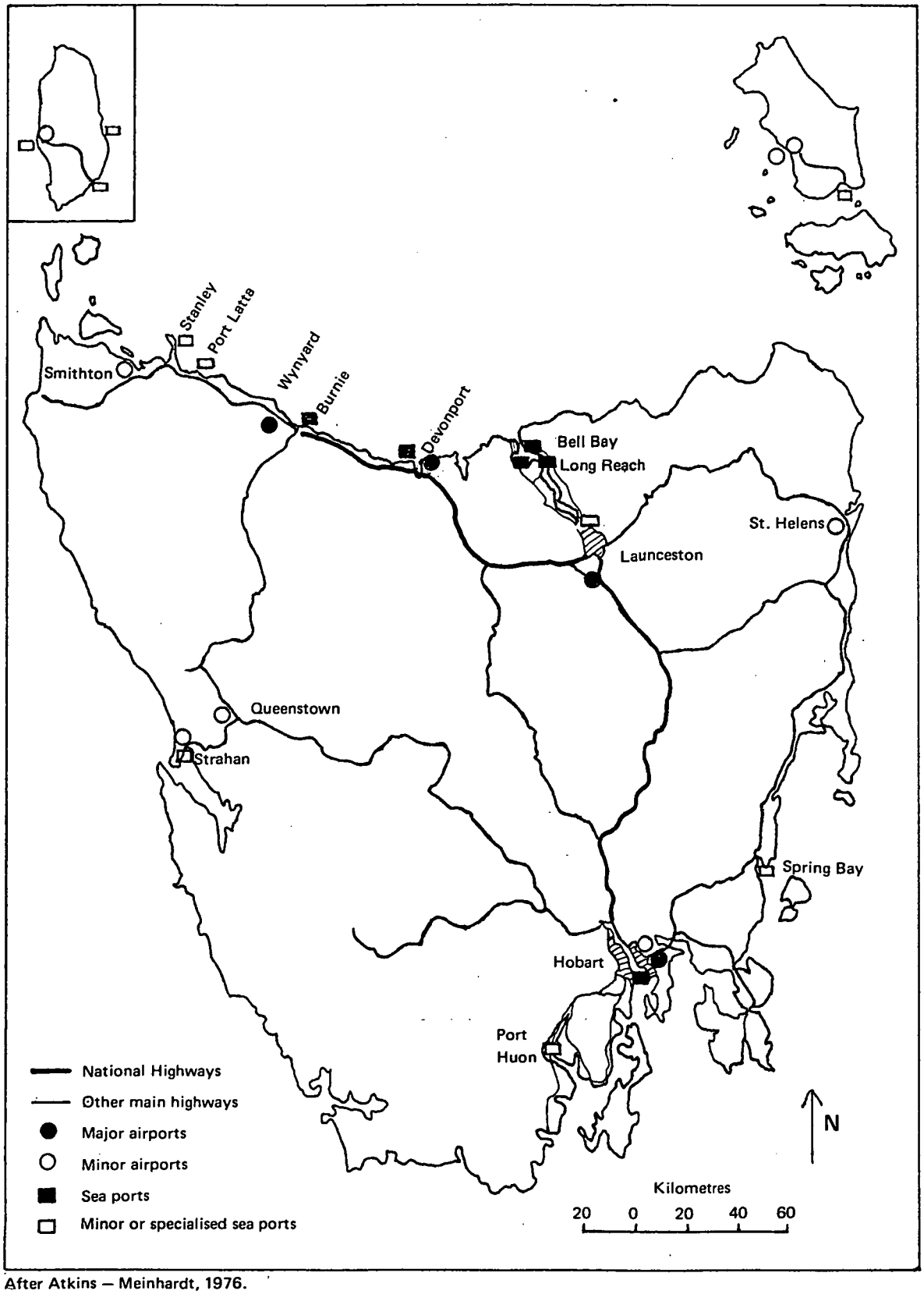
The airport serving Launceston and its region is located at Western Junction, 16 km. south east of Launceston. Its activities involve the movement of both air cargo and passengers, and has the record of handling more air cargo than any airport elsewhere in Tasmania, and ranks second to Hobart in passenger transport. In 1978-79,[10] Launceston's airport accounted for 49 per cent of the total value of Tasmanian interstate air trade (both imports and exports), compared with Hobart airport's

---

8 Note however, problems of cost, unreliability and infrequency with these transport links, as discussed earlier, do exist.

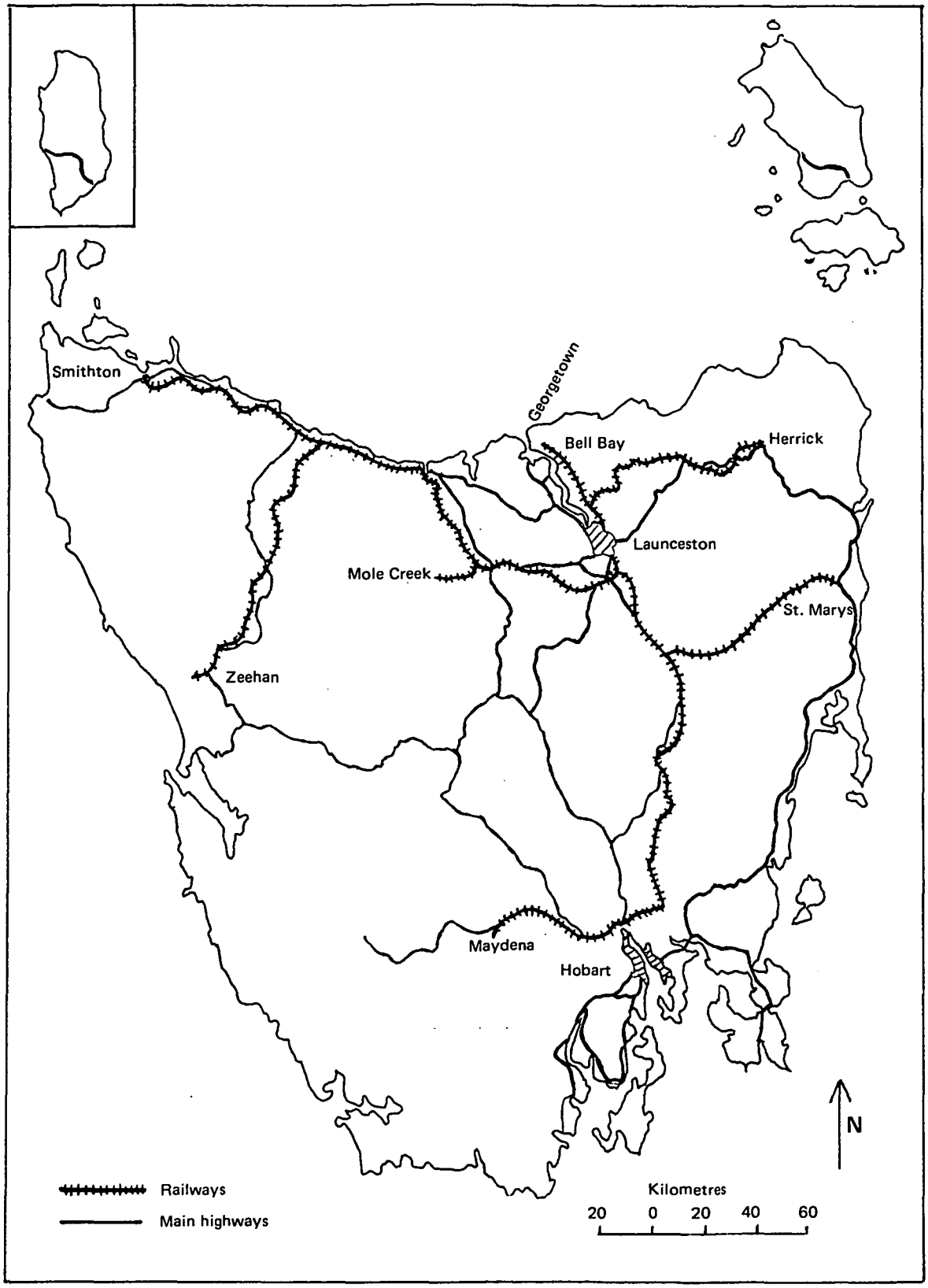
9 Not an absolute dominance, however (Refer Table 1.21). Clearly, reduced employment in Government services increases the manufacturing relativity for Launceston.

10 The last year for which disaggregated data are available.



After Atkins – Meinhardt, 1976.

Figure A1.4: The Tasmanian road network and the location of air and sea ports, 1981.



After Atkins – Meinhardt, 1976.

Figure A1.5: The Tasmanian rail network, 1981.

39 per cent. With respect to interstate export trade, Launceston's airport is pre-eminent, having handled 76 per cent of Tasmanian exports to the mainland by air compared with 18 per cent for Hobart. The equivalent statistics for imports from interstate were 50 per cent and 35 per cent respectively (Tasmanian Yearbook, 1981). Whilst this reflects the potential for cheaper back-haul rates from Launceston due to the focusing of newspaper delivery and Australia Post receipt and dispatch at Launceston airport, locational centrality and proximity to mainland Australia are obviously important. Moreover, the differentials identified above are expanding. In terms of tonnage loaded and unloaded, Hobart airport has declined from 36 to 33 per cent of total freight compared with an increase at Launceston from 60 to 65 per cent over the period 1976-81 (Tasmanian Yearbook, 1983). Thus, the growing distributive role for Launceston is emphasised.

Sea transport is facilitated by a sea port infrastructure provided by the Port of Launceston Authority (P.L.A.) which operates a decentralised port system along the 64 km. of navigable water from Launceston to the mouth of the Tamar river. At the mouth, deep water and accessible sites on each side of the river provide an important natural harbour allowing vessels drawing up to 11.1 m. access 16 km. inland from Bass Strait. The structure of the port system serving Launceston and the Northern region is as follows (Tasmanian Yearbook, 1983):

(i) Bell Bay: the Bell Bay site is on the eastern shore, some 13 kilometres upstream from the mouth of the Tamar. The Bell Bay and Long Reach areas are linked to the railway system. Wharves include the A.N.L. Melbourne/Sydney roll-on roll-off/lift-on lift-off Cargo Terminal, two berths serving adjacent manufacturing plants, the P.L.A. tanker berth and the P.L.A. Common User Berth general cargo berth. The port has large, modern cold store facilities, stock-yards and petroleum storage tanks.

(ii) Long Reach: Port facilities have been developed upstream from Bell Bay, the main function being export of woodchips from adjacent plants.

(iii) Inspection Head: Overseas berths are situated on the western bank, opposite Bell Bay, for shipment of fruit, frozen meat, fish, wheat and general cargo. Large cool storage and freezer facilities are provided as well as bulk storage and special loading facilities for tallow.

(iv) Kings Wharf, Launceston: Includes berths for interstate and intrastate trade; facilities also include a graving dock and shiplift and fitting-out berths for docking and repair of vessels up to 2,200 tonnes.

In 1977-78, more ships with a greater net tonnage entered the Launceston port system than any other Tasmanian port (Table A1.22).[11] Thirty one per cent of the total tonnage through all Tasmanian ports in that year was handled by P.L.A. ports, the corresponding figure for Hobart being 22 per cent, a pattern which is consistent for both discharged and shipped cargo. Furthermore, Launceston surpasses all other ports in the total movement of interstate cargo and ranks second to Stanley in the movement of overseas goods, but only because part of the Stanley system includes the specialised berthing facility at Port Latta for the export of bulk iron ore. The more restricted 1980-81 data (Table A1.22), indicate that this pattern has continued.

Thus, Launceston is equipped to handle the inter-modal nature of interstate and international transport, and is more active in these areas than ports elsewhere in the state. It is because of such transport infrastructure, located as it is in close proximity to mainland Australia, close to world shipping lanes through Bass Strait, and connected to the rest of Tasmania by adequate road and rail facilities, that locational benefits over and above the natural resource base of the region accrue to Launceston. These features, together with the fact that Launceston has been able to offer cheap industrial land, cheap power, a relatively stable labour force and adequate supplies of fresh water, have resulted in a

---

11 1977-1978 was the last year for which disaggregated data are available. A comparison of the amounts of sea cargo passing through Tasmanian ports is made difficult by the use of both weight and volume units, however. The reason for this is that goods are usually recorded in weight measures if one tonne stows in less than one cubic metre, otherwise volumetric measures are used. In order to facilitate some form of comparison, shipping statistics recorded by volume have been converted for 1977-78 on the basis of one cubic metre equals one tonne, even though this will ultimately create a conservative estimate of tonnage throughput.

Table A1.22: Cargo discharged and shipped at Tasmanian ports.

Port Authority	1977-78[1]							1980-81[2]		
	Discharged ('000 tonnes)			Shipped ('000 tonnes)			Total ('000 tonnes)	Overseas ('000 tonnes)		
	Overseas	Interstate	Total	Overseas	Interstate	Total		Discharged	Shipped	Total
Launceston	87.6	1,307.1	1,394.7	1,410.8	531.8	1,942.6	3,337.3	73.7	1,864.3	1,937.9
Hobart	136.5	891.3	1,027.8	647.6	659.9	1,307.5	2,335.3	139.2	949.3	1,088.6
Spring Bay[3]	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*0.0*	*133.8*	*133.8*
Stanley	19.0	60.1	79.1	1,887.3	38.4	1,925.7	2,004.8	23.0	2,093.1	2,116.1
Port Latta[3]	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*12.5*	*2,093.1*	*2,105.6*
Devonport	4.1	729.4	733.4	42.2	782.9	825.1	1,558.5	6.2	33.9	40.0
Burnie	54.2	562.5	616.7	190.3	641.7	832.0	1,448.7	67.3	233.6	300.9
King Island	0.0	9.2	9.2	0.0	8.3	8.3	17.4	n.a.	n.a.	n.a.
Flinders Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
TOTAL	301.4	3,559.5	3,860.9	4,178.2	2,662.9	6,841.1	10,702.0	309.3	5,174.2	5,483.6

n.a. = Not available.

1. 1977-78 was the last year for which information on interstate shipping was compiled. In that year statistics for the port of Hobart also include Port Huon (South of Hobart for fruit export), Strahan (West Coast for interstate trade) and Spring Bay (East Coast for woodchip export), and the port of Stanley includes Port Latta (bulk iron ore export).

2. In 1980-81, overseas shipping only was compiled, and the statistics for the port of Hobart include Port Huon. The ports of Strahan, Stanley and those on King and Flinders Islands are not included as they handle interstate shipping only.

3. Figures in italics represent the components moving through the specialised ports.

Source: A.B.S., Tasmanian Yearbook, 1981, 1983.

manufacturing economy surpassing that normally associated with a provincial city servicing a predominantly rural hinterland.

A1.2.2 The evolution of manufacturing in Launceston.

The earliest development of manufacturing in Launceston was very closely associated with the needs of the immediate population, the surrounding farming community and the shipping community concerned with whaling and trading. Manufactured products were provided by blacksmiths, wheelwrights, shipwrights, flour millers, brewers, brick makers, tanners, newspaper proprietors and soap and candle makers. Ship building, flour milling and to some extent tanning and brewing were the most important in generating export income. However, the 1850s witnessed the demise of shipbuilding due to lack of demand and the move to steam powered ships, and flour milling based on export demand declined from the 1860s due to increasing self-sufficiency on the mainland.[12]

In the 1870s, the manufacturing economy was boosted by the introduction of tin smelting, the ore being derived from the Mt. Bischoff mine in western Tasmania and the refined product being exported to international markets. Further manufacturing was initiated by the decision to establish the first railway in Tasmania from Launceston to Deloraine, opened in 1871, and the Tasmanian textile industry first began production

---

12 Sources used to gather information on the early history of manufacturing in Launceston were Reynolds (1969), Linge (1975), various Tasmanian Yearbooks, and discussions with Miranda Morris-Nunn, local historian, Queen Victoria Museum and Art Gallery.

in Launceston in 1874 with the manufacture of woollen blankets using hand looms. Clay pipe manufacture was also initiated at this time in response to a growing concern for community hygiene. Boom years of the late 1870s and 1880s also witnessed vigorous activity in the engineering sector, with workshops providing services to the mining, quarrying, smelting, timber milling and brick making industries. In particular, the gold mining activities of the immediate hinterland provided considerable stimulus which, in addition to the tin smelting, made Launceston the financial hub of mining activity in Tasmania in the late nineteenth century (Reynolds, 1969).

In 1891, a Tasmanian International Exhibition was staged in Launceston at which a range of local products including blankets, furniture from native timber and clay ware were exhibited, and at which the flour milling, brewing and soft drink industries were represented. By the early 1890s work commenced on the construction of the Duck Reach hydro electric power station, developed in the hope of stimulating further industrial activity, and in 1895 Launceston became the first city in the Southern hemisphere to have street lighting operated on hydro electricity.

The ensuing 30 years were characterised by relatively depressed conditions in the Launceston economy, culminating with the closure of the tin smelters in 1923. By this stage the worst of the recession was over, however. The closure of the smelters coincided with the development of the railway workshops in Launceston as the centre for the state rail system, and the establishment of a major manufacturer producing knitting yarns. Shortly thereafter, new factories were initiated for the manufacture of

flannel, worsted, knitwear, suitings, sportswear, furniture, building materials and tennis rackets; and the older industries of brewing, malting, flour milling, coal gas production and engineering workshops acquired updated plant and adopted new processes. Thus, the Launceston manufacturing economy recovered from the losses precipitated largely by the demise of the mining based activities, and the city was established as the centre of the textile industry in Tasmania. It was is these circumstances that local manufacturing was about to face the general economic malaise of the nation in the 1930s, and a marked downturn in activity ensued.

The next major event which influenced the development of manufacturing in Launceston was the outbreak of World War II. This stimulated increased activity in the railway workshops, together with the formation of a tool and gauge, and an ammunitions, annexe. Local foundries and engineering workshops increased their production (which included, in association with the railway workshops, the manufacture of panel bridges for the war effort), clothing and blanket factories were operating at full capacity, the production of automotive parts was initiated, and shipyards were active in the production of small vessels.

After World War II, the Launceston manufacturing economy grew steadily for two and a half decades, the greatest single impact being the introduction of a major automotive bearing manufacturer servicing mainland and overseas markets. Development reached a peak in the late 1960s, based primarily on activities concentrated in the Textile, Transport equipment, Food and beverages, and Wood, wood products and furniture manufacturing sub-divisions. Since 1970, the manufacturing sector has undergone rapid

decline as the effects of the structural adjustment processes of the national economy have been experienced locally. Statistics for the decade 1968-78 reflect this most recent phase in which Launceston's manufacturing economy has been thrust from boom to recession.

Because of the importance of the most recent changes, the period 1968-69 to 1980-81 is examined in detail, and is specifically compared with the experience of the national manufacturing economy rather than merely the Tasmanian structure, as it is felt that national adjustments provide a more appropriate benchmark for critical analysis. National trends within the global manufacturing system rather than specifically Tasmanian trends provide the context within which changes occur, although as previously discussed, peculiarly Tasmanian issues are sometimes important, and these will emerge where relevant. The base year of 1968-69 is chosen for two reasons. Firstly, it represents the initiation of the 'Integrated Manufacturing Census' of the Australian Bureau of Statistics data collection procedure, and secondly, it coincides with the peak in manufacturing development in Launceston prior to the demise of the 1970s. Other key dates chosen for the analysis are 1972-73, a period of relative decline prior to absolute contraction; 1977-78, the time at which the depths of national industrial recession were reached (Rich, 1982); and 1980-81 to identify the most recent trends culminating in the structure extant at the time the survey associated with this study was undertaken.

A number of problems were encountered in obtaining data for a relatively small urban unit, however. In some cases individual or very few firms dominate specific manufacturing sub-divisions. Thus, some A.B.S. data

for 1977-78 and 1980-81 were not available for publication for confidentiality reasons. For employment statistics, however, the author was able to estimate missing data by way of local knowledge, separately recorded employment losses and the survey data associated with this study. Nonetheless, the figures arrived at represent estimates only (identified in Table A1.24), and must be treated with a certain degree of caution. More importantly, assessment of value added and productivity are impossible. There were no indirect avenues via which these gaps in the published data could be overcome. Moreover, it is the intention of this investigation to assess all manufacturing activity, including those establishments employing less than four persons, because of their anticipated importance to the manufacturing economy of Launceston. Value added data are not collected for such firms. Thus, the ensuing discussion is based entirely on employment statistics, and even then within the limitations identified above.

Launceston's employment in manufacturing is an obviously small component of national manufacturing overall, 0.57 per cent in the early 1970s, and it has witnessed absolute and relative decline since then to 0.47 per cent of the national total in 1980-81 (Table A1.23). As a proportion of the Tasmanian total, it was at a maximum in 1972-73 (24.1 per cent) but, with the dramatic decline in textiles in the mid 1970s, it was reduced to 19.8 per cent by 1980-81.

The period 1968-69 to 1972-73 presented a relatively stable episode in the evolution of the manufacturing economy in Launceston (Table A1.24). It represented the final growth stage, with employment increasing at 1.8 per cent over the five year period. Minimal change in what was a relatively

specialised manufacturing labour force structure occurred over that period. The specific sectors in which Launceston was most specialised *vis-à-vis* Australia were, in order, Textiles, Wood, wood products and furniture, and Transport equipment (Table A1.25), and each of these coincided with high levels of local employment: 35.4, 14.3 and 15.5 per cent respectively of the Launceston manufacturing labour force in 1972-73. The other area of substantial contribution to the local economy over this period was Food and beverage manufacture, 13.2 per cent of manufacturing employment, but slightly under-represented relative to national levels.

Table A1.23: Launceston manufacturing employment relative to Tasmania and Australia.[1]

Year	L'ton emp.	Percentage share		Employment change (%) over preceding period		
		Tas.	Aus.	L'ton.	Tas.	Aus.
1968-69	7,252	23.3	0.57	-	-	-
1972-73	7,385	24.1	0.57	+ 1.8	- 1.3	+2.9
1977-78	5,476	19.9	0.47	-25.8	-10.3	-9.9
1980-81	5,366	19.8	0.47	- 2.0	- 1.7	-1.4

1. Note conditions associated with this data and changes in the data base. These are described fully in the footnotes of the Table A1.24.
Source: Based on data in Table A1.24, plus the Tasmanian sources cited therein. Author's calculations.

Between 1972-73 and 1977-78, the situation deteriorated dramatically with 1909 manufacturing jobs lost. From the growth rate of 1.8 per cent over the earlier period under consideration, it dropped to -25.8 per cent over the ensuing five years, compared with a statewide decline of -10.3 per cent and a national decline of -9.9 per cent. The greatest absolute loss in employment occurred in the two sectors most crucial to the economy, Textile manufacture where 1,597 jobs were lost, and Transport equipment

Table A1.24: Manufacturing employment, Launceston and Australia.[1]

Manufacturing sub-divisions[2]	Launceston[3]								Australia							
	1968-69		1972-73		1977-78		1980-81		1968-69		1972-73		1977-78		1980-81	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Food, beverages, tobacco	956	13.2	978	13.2	898	16.4	946	17.6	184,806	14.7	203,098	15.7	197,059	16.9	176,412	15.3
Textiles	2,643	36.4	2,617	35.4	1,020*	18.6	775*	14.4	58,689	4.7	53,832	4.1	37,634	3.2	35,221	3.1
Clothing and footwear	181	2.5	154	2.1	90*	1.6	80*	1.5	122,130	9.7	111,621	8.6	82,175	7.0	79,512	6.9
Wood, wood products and furniture	885	12.2	1,055	14.3	1,012	18.5	1,011	18.8	80,311	6.4	82,834	6.4	80,673	6.9	84,041	7.3
Paper, paper products and printing	511	7.0	544	7.4	539	9.8	570	10.6	101,565	8.1	105,995	8.2	99,569	8.5	104,379	9.1
Chemical, petroleum and coal products	34	0.5	52	0.7	63	1.2	65*	1.2	63,764	5.1	65,487	5.0	62,200	5.3	56,603	4.9
Non-metallic mineral products	213	2.9	187	2.5	141	2.6	78	1.5	51,114	4.1	53,025	4.1	47,294	4.0	44,626	3.9
Basic metal products	0	0.0	0	0.0	0	0.0	0	0.0	88,240	7.0	95,101	7.3	88,826	7.6	93,202	8.1
Fabricated metal products	515	7.1	438	5.9	515	9.4	710	13.2	112,793	8.9	115,719	8.9	107,178	9.2	118,547	10.3
Transport equipment	1,083	14.9	1,148	15.5	662*	12.1	572*	10.7	144,514	11.5	152,818	11.8	136,164	11.7	128,881	11.2
Other machinery and equipment	210	2.9	168	2.3	406	7.4	440	8.2	187,966	14.9	184,712	14.2	163,518	14.0	163,972	14.2
Miscellaneous manufacturing	21	0.3	44	0.6	130	2.4	119	2.2	65,385	5.2	73,346	5.7	66,421	5.7	66,705	5.8
TOTAL	7,252	100	7,385	100	5,476	100	5,366	100	1,261,277	100	1,297,588	100	1,168,711	100	1,152,101	100

* Data for these sub-divisions at these dates are not available for publication. The figures listed are the author's estimates based on separately recorded employment losses and the survey data collected for this study.

1. All manufacturing employment, including single establishments employing less than four persons.

2. 1968-69 and 1972-73 data based on A.S.I.C. (1969). 1977-78 and 1980-81 data based on A.S.I.C. (1978). The A.S.I.C. (1978) revision reduced registered manufacturing employment in Australia by about 0.13 per cent (Rich, 1982). Its impact at the A.S.I.C. sub-division level is minimal and the specifically local Launceston effects are negligible.

3. The Launceston urban area as defined by A.B.S.

Source: A.B.S., Manufacturing establishments, Australia, 1968-69, 1972-73, 1977-78, 1980-81.
A.B.S., Manufacturing establishments, Tasmania, 1968-69, 1972-73 and A.B.S.(Tasmanian office), unpublished data, 1977-78 and 1980-81.
Author's calculations.

Table A1.25: Key sub-divisions in the recent evolution of the Launceston manufacturing economy.

Manufacturing sub-division[1]	1968-69		1972-73		1977-78		1980-81	
	Employment (%)[2]	L.Q.[3]	Employment (%)[2]	L.Q.[3]	Employment (%)[2]	L.Q.[3]	Employment (%)[2]	L.Q.[3]
Textiles	36.4	7.745	35.4	8.634	18.6	5.813	14.4	4.645
Transport equipment	14.9	1.296	15.5	1.314	12.1	1.034	10.7	0.955
Food, beverages and tobacco	13.2	0.898	13.2	0.841	16.4	0.970	17.6	1.150
Wood, wood products and furniture	12.2	1.906	14.3	2.234	18.5	2.681	18.8	2.575
Fabricated metal products	7.1	0.798	5.9	0.663	9.4	1.022	13.2	1.282
Paper, paper products and printing	7.0	0.864	7.4	0.902	9.8	1.153	10.6	1.165
Other machinery and equipment	2.9	0.195	2.3	0.162	7.4	0.529	8.2	0.577
TOTAL	93.7		94.0		92.2		93.5	

1. Ranked by percentage share of total manufacturing employment in 1968-69
2. Percentage share of total manufacturing employment.
3. Location quotient as defined in Table A1.20.

Source: Author's calculations based on data in Table A1.24 .

which recorded a loss of 486 employees, both of which were declining nationally, though to a lesser extent. The loss in Transport equipment was not as substantial as first appears, however. This was largely the result of one state government operation, previously very heavily involved in maintenance and repair as well as manufacture, which had become a maintenance and repair workshop only by 1978, and thus reclassified. The precise level of manufacturing employment loss is unavailable.

Nonetheless, because Launceston was so specialised in these areas (especially Textiles), and the numbers employed were relatively high, the impact on the economy and the local community was disastrous. These declines were largely responsible for the (then) very high levels of local unemployment experienced around this time, 4.0 per cent of the Launceston

labour force in 1976 compared with 2.1 per cent in 1971 (A.B.S., Unpublished census data).[13] Similarly high (proportional) losses also occurred in the Clothing and footwear sub-division, although in absolute terms this was not of critical importance overall.

Accompanying these major changes were adjustments to the overall structure of Launceston's manufacturing economy, highlighted by an absolute and relative increase in Other machinery and equipment accounting for 7.4 per cent of manufacturing employment in 1977-78, and to a lesser extent Fabricated metal products (9.4 per cent by 1977-78). Of the other dominant employers of labour, slight absolute decline but relative increase occurred for Wood, wood products and furniture, and Food and beverage manufacture, employing 18.6 and 16.4 per cent respectively of all manufacturing workers in 1977-78. Overall, therefore, the marked absolute decline suffered in the period 1972-73 to 1977-78 paralleled, but was greater, than that experienced nationally due to a greater local concentration in the declining activities, especially Textiles. Nevertheless, this decline coincided with a trend towards an increasing diversification of Launceston's manufacturing economy.

The most recent experience (1977-78 to 1980-81) was clearly one of consolidation, with both Launceston and national manufacturing employment declining at two per cent or less over the three years, although Launceston continued to display a slightly greater relative loss (-2.0 per cent compared with -1.4 per cent nationally). In terms of overall structure, little deviation occurred from that which emerged from the massive

---

13 Labour force survey data are unavailable for the Launceston urban area, thus the necessity to use census data.

restructuring of the mid 1970s and recorded for 1977-78. Absolute and relative decline (nationally) continued to occur for Textile and Transport equipment manufacture, but the rate of decline was substantially lower than the earlier period; minor absolute growth occurred for Paper, paper products and printing (close to the national rate of increase), Other machinery and equipment (but less than the national rate), Food and beverages (which declined nationally); while decline relative to the national trend occurred for Wood, wood products and furniture, although in absolute terms this sub-division maintained its status quo almost exactly. The only other change to occur over this period was in the manufacture of Non-metallic mineral products, where substantial absolute and relative decline took place. The overall contribution of this sub-division to the local economy is relatively minor, however.

Thus, the period in question, a little over a decade, witnessed substantial modification in the Launceston manufacturing economy, modification which essentially related to large local declines in the nationally declining activities of Textiles and Transport equipment manufacture. It was accompanied by an overall increasing diversification within the local employment structure as a result of these relative shifts within the sector, but due also to greater than national average growth in certain areas, especially Fabricated metal products, Food and beverages, and Other machinery and equipment.

In order to ascertain specifically the extent to which these changes reflected national trends, or were peculiar to the local economy, the data are subjected to shift and share analysis. A full description of the

technique is provided in Section A1.3. Briefly, however, (and within the context of this investigation), the technique assesses the actual total change (A.T.C.) in local manufacturing employment in terms of the overall change expected based on total change in the national economy, or the region's share - the National Growth Element (N.G.E.). The difference in the two represents a relative shift (R.S.) in the local economy, made up of a component relating to the local manufacturing structure, and thus its share of national growth dynamics - the Industry Mix Effect (I.M.E.), and a component relating to local conditions - the Regional Competitive Effect (R.C.E.). The sum of the National Growth Element, the Industry Mix Effect and the Regional Competitive Effect equal the Actual Total Change in local manufacturing.

Change in the Launceston manufacturing economy over the early growth period (1968-69 to 1972-73) was primarily a function of quite negative effects relating to the local manufacturing structure (I.M.E. = -218). This was compensated to some extent by important competitive effects (R.C.E. = +141), but these were not sufficient to prevent a less than proportional share of national growth overall (R.S. = -77)(Table A1.26 and Figure A1.6). Thus, Launceston had an unfavourable growth mix during that period. That is, there was a relative concentration of the nationally slower growing or declining activities, though this was essentially the result of Textile manufacture alone. Nonetheless, local activity in this sub-division was characterised by a considerable competitive advantage. However, discussion with firms during the survey indicated that this was not due to changes in technology. Thus, reduced demand for Textile products in general had not filtered through to the locally manufactured goods. This may have been a

Table A1.26: Shift and share analysis of manufacturing employment changes, Launceston 1968/69-1972/73.

Manufacturing sub-divisions	Australia	Launceston			
	Percentage change	Percentage change	Actual change	Expected change	Unexpected change
Food, beverages, tobacco	+ 9.9	+ 2.3	+ 22	+ 95	- 73
Textiles	- 8.3	- 1.0	- 26	-219	+193
Clothing and footwear	- 8.6	-14.9	- 27	- 16	- 11
Wood, wood products and furniture	+ 3.1	+19.2	+170	+ 27	+143
Paper, paper products and printing	+ 4.4	+ 6.5	+ 33	+ 22	+ 11
Chemical, petroleum and coal products	+ 2.7	+52.9	+ 18	+ 1	+ 17
Non-metallic mineral products	+ 3.7	-12.2	- 26	+ 8	- 34
Basic metal products	+ 7.8	-	-	-	-
Fabricated metal products	+ 2.6	-15.0	- 77	+ 13	- 90
Transport equipment	+ 5.7	+ 6.0	+ 65	+ 62	+ 3
Other machinery and equipment	- 1.7	-20.0	- 42	- 4	- 38
Miscellaneous manufacturing	+12.1	+109.5	+ 23	+ 3	+ 20
TOTAL			+133	- 8	+141

National growth = +2.9 per cent. Launceston growth = +1.8 per cent
Overall local change expected based on national growth element (N.G.E.) = +210
Actual total change locally (A.T.C.) = +133
Relative shift. : A.T.C. minus N.G.E. (R.S.) = - 77
Industry mix effect: total of expected changes per manufacturing sub-division minus N.G.E. (I.M.E.) = -218
Regional competitive effect: A.T.C. minus total of expected changes per manufacturing sub-division, i.e. Total unexpected changes (R.C.E) = +141
Components of change: A.T.C. = N.G.E. + I.M.E. + R.C.E.
+133 = (+210) + (-218) + (+141)

Source: Author's calculations based on data in Table A1.24.

function of marketing strategies, existing contractual arrangements or product mix. Elsewhere, strong competitive effects were largely restricted to Wood, wood products and furniture production which, it may be postulated, related to comparative advantage based on local resources. Negative competitive effects were recorded for the manufacture of Fabricated metal products, Food and beverages, Other machinery and equipment, and Non-metallic mineral products. Of these, the relative decline in Food and beverages had the greatest impact on the local economy, and interestingly, the comparative advantage of a rural area would appear to have been negated by static markets. This related mainly to meat products from which the majority of local exports in this category are derived, and which is characteristically subject to wide fluctuations in external demand.

During the period of greatest local and national decline (1972-73 to 1977-78), there was a substantially adverse relative shift (R.S. = -1,178) locally (Table A1.27 and Figure A1.6). This was dominated by unfavourable competitive effects (R.C.E. = -788), which were themselves reinforced by a greater than proportional share of nationally declining activities (I.M.E. = -390). Launceston had high proportions employed in the rapidly declining sub-divisions of Textiles and Transport equipment. However, absolute decline did not permeate all local manufacturing sub-divisions as it did nationally, and favourable competitive influences existed for Other machinery and equipment, Fabricated metal products (both a reversal of the previous period) and the locally small component of Miscellaneous manufacturing. Elsewhere, the competitive effects were small or unfavourable. Indeed, strongly negative competitive effects compounded the

Table A1.27: Shift and share analysis of manufacturing employment changes, Launceston 1972/73-77/78

Manufacturing sub-divisions	Australia	Launceston			
	Percentage change	Percentage change	Actual change	Expected change	Unexpected change
Food, beverages, tobacco	- 3.0	- 8.2	- 80	- 29	- 51
Textiles	-30.1	- 61.0	-1,597	- 788	-809
Clothing and footwear	-26.4	- 41.6	- 64	- 41	- 23
Wood, wood products and furniture	- 2.6	- 4.1	- 43	- 27	- 16
Paper, paper products and printing	- 6.1	- 0.9	- 5	- 33	+ 28
Chemical, petroleum and coal products	- 5.0	+ 21.2	+ 11	- 3	+ 14
Non-metallic mineral products	-10.8	- 24.6	- 46	- 20	- 26
Basic metal products	- 6.6	-	-	-	-
Fabricated metal products	- 7.4	+ 17.6	+ 77	- 32	+109
Transport equipment	-10.9	- 42.3	- 486	- 125	-361
Other machinery and equipment	-11.5	+141.7	+ 238	- 19	+257
Miscellaneous manufacturing	- 9.4	+195.5	+ 86	- 4	+ 90
TOTAL			-1,909	-1,121	-788

National growth = -9.9 per cent. Launceston growth = -25.8 per cent.

Overall local change expected based on national growth element (N.G.E.) = -731
Actual total change locally (A.T.C.) = -1,909
Relative shift: A.T.C. minus N.G.E. (R.S.) = -1,178
Industry mix effect: total of expected changes per manufacturing sub-division minus N.G.E. (I.M.E.) = - 390
Regional competitive effect: A.T.C. minus total of expected changes per manufacturing sub-division, i.e. Total unexpected changes (R.C.E.) = - 788

Components of change: A.T.C. = N.G.E. + I.M.E. + R.C.E.
-1,909 = (-731) + (-390) + (-788)

Source: Author's calculations based on data in Table A1.24.

mix effects for Textiles (which was a notable reversal of the earlier period), and Transport equipment, and Food and beverages continued to bear the brunt of an unfavourable competitive component as a result of export market contraction.

As discussed previously, however, the apparent decline in the Transport equipment sub-division over the period 1972-73 to 1977-78, whilst to some extent a loss in the production of manufactured goods, was essentially the result of reclassification. For Textiles on the other hand, the national effects of market contraction in the face of increasing competition due to increasing labour costs and a lack of capital investment which had previously been buffered by high levels of tariff protection (Rich, 1982), were felt to an extreme degree in the local economy. Closures resulted, employment shedding occurred elsewhere, and in only some of those firms that remained was employment shedding accompanied by the introduction of new technology (informal data gained during the Launceston manufacturing survey). Clearly, low levels of local productivity (reflected in the statewide statistics - refer Table A1.12) relative to Australia as a whole created a situation in which such relative decline was inevitable. Nonetheless, for the major employers of labour in this sub-division, the local operations were part of larger transnational corporations, with Australian control centred in the national core. This undoubtedly had some impact on the decidedly more adverse local experience than that occurring nationally, the importance of which was highlighted by Rich (1981), and the potential for which has been highlighted by Taylor and Thrift (1982c).

Thus, Launceston's participation in the net negative adjustments of

national manufacturing overall was quite variable over the period 1972-73 to 1977-78. Perhaps the most interesting aspect however, was the overall increase in the diversification of the local economy, as identified earlier. This was not based solely on relativities associated with the rapidly declining sectors, but also increases that were against national trends (Other machinery and equipment, and Fabricated metal products). Perhaps this growth reflected a tendency towards greater local self-sufficiency in these activities which may well be utilising Launceston's centrality (discussed earlier), from which to cater to a statewide market for essentially service oriented manufacturing.

Turning finally to the shift and share analysis of the most recent phase (1977-78 to 1980-81), it is clear that overall declines were relatively minor. This probably reflects the beginning of a period of relative stability after the major re-adjustment, and at that stage was characterised by the Launceston economy, in aggregate, reverting to a much closer approximation of national trends (Table A1.28 and Figure A1.6). Relative shift locally was minor (R.S. = -33), and was largely a response to a small, but unfavourable, competitive element overall (R.C.E. = -25), reinforced by a slightly negative mix effect (I.M.E. = -8).

Nonetheless, within the local manufacturing sector the effects of these components were quite varied. Negative mix and competitive effects continued to be a feature of Textile and Transport equipment manufacture, and in this case the changes in the latter did not involve any reclassification effect. At this time most Launceston manufacturing employment in Transport equipment, as well as Textiles, was within the

Table A1.28: Shift and share analysis of manufacturing employment changes, Launceston 1977/78-1980/81.

Manufacturing sub-divisions	Australia	Launceston			
	Percentage change	Percentage change	Actual change	Expected change	Unexpected change
Food, beverages, tobacco	-10.5	+ 5.3	+ 48	-94	+142
Textiles	- 6.4	-24.0	-245	-65	-180
Clothing and footwear	- 3.2	-11.1	- 10	- 3	- 7
Wood, wood products and furniture	+ 4.2	- 0.1	- 1	+43	- 44
Paper, paper products and printing	+ 4.8	+ 5.8	+ 31	+26	+ 5
Chemical, petroleum and coal products	- 9.0	+ 3.2	+ 2	- 6	+ 8
Non-metallic mineral products	- 5.6	+44.7	- 63	- 8	- 55
Basic metal products	+ 4.9	-	-	-	-
Fabricated metal products	+10.6	+37.9	+195	+55	+140
Transport equipment	- 5.3	-13.6	- 90	-35	- 55
Other machinery and equipment	+ 0.3	+ 8.4	+ 34	+ 1	+ 33
Miscellaneous manufacturing	+ 0.4	- 8.5	- 11	+ 1	- 12
TOTAL			-110	-85	- 25

National growth = -1.4 per cent. Launceston growth = -2.0 per cent.

Overall local change expected based on national growth element (N.G.E.) = - 77
Actual total change locally (A.T.C.) = -110
Relative shift: A.T.C. minus N.G.E. (R.S.) = - 33
Industry mix effect: total of expected changes per manufacturing sub-division minus N.G.E. (I.M.E.) = - 8
Regional competitive effect: A.T.C. minus total of expected changes per manufacturing sub-division i.e. Total unexpected changes (R.C.E.) = - 25

Components of change: A.T.C. = N.G.E. + I.M.E. + R.C.E.
-110 = (-77) + (-8) +(-25)

Source: Author's calculations based on data in Table A1.24.

realm of 'peripheral branches of a transnational corporations', which previously had dominated the Textile sub-division only. This may, in part, explain the disadvantageous competitive element in an economy which is subordinate to national core areas (Rich, 1981). Food and beverage production was the only other manufacturing category to record an unfavourable mix effect, yet in this period local activity in this sub-division had a decided competitive advantage, perhaps reflecting an upturn in the fluctuating export market for the products concerned. Market instability, as identified by Wilde (1980b), is a crucial factor influencing local adjustments in the processing of agricultural commodities.

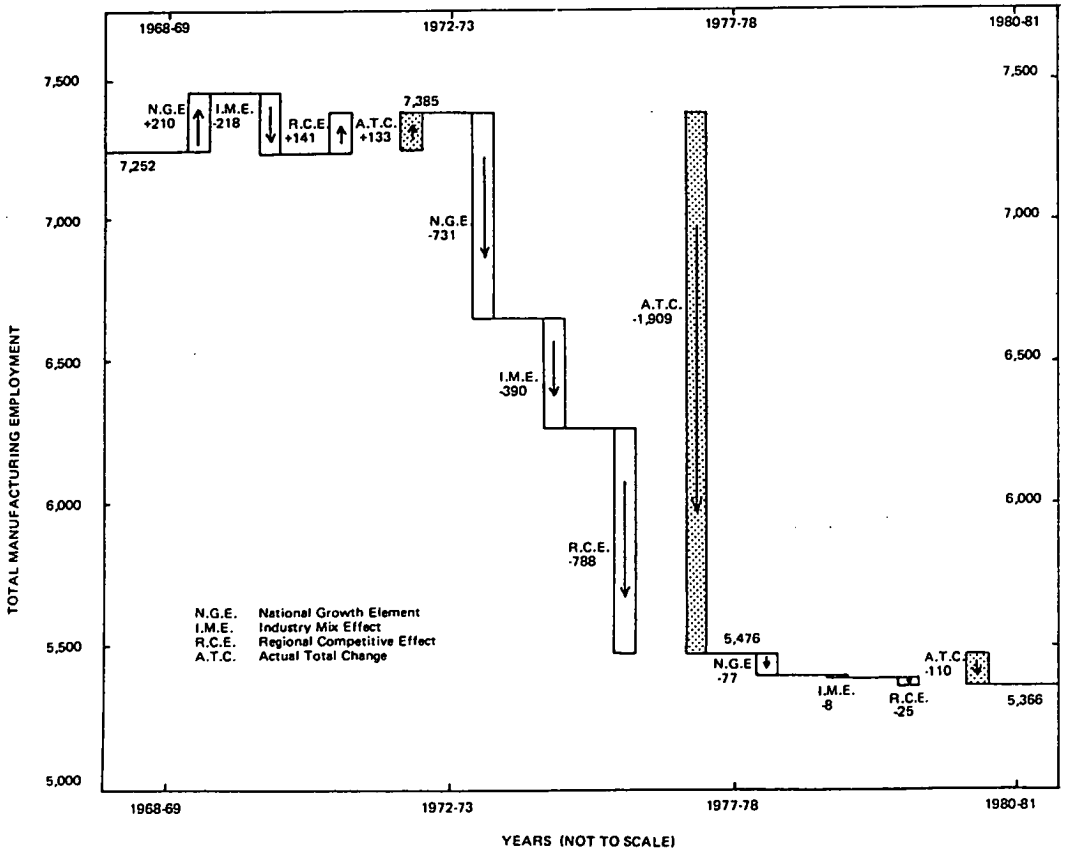


Figure A1.6: The components of change in Launceston's manufacturing labour force, 1972/73-1980/81.

Favourable competitive effects continued to be a feature of Fabricated metal products manufacture, and to a lesser extent in the production of Other machinery and equipment, resulting in quite strong relative growth in these sub-divisions. Thus, the trend towards diversification identified in the previous period was establishing itself as a permanent feature of the local economy. Elsewhere within the economy, unfavourable competitive influences were felt by the Non-metallic mineral products sub-division, a very small component of the local economy; and in the Wood, wood products and furniture sub-division, a dominant local activity. Wood based manufacture witnessed modest growth nationally but remained static in Launceston. Thus, circumstances peculiar to the local situation were responsible. Since the nature of the dominant products, semi-processed and processed timber, involves production that is not subject to rapidly changing technology, nor indeed high capital investment, specific market contraction rather than decreasing competitive ability as a result of low local productivity levels (which are quite high in Tasmania relative to Australia - refer Table A1.12) would seem to have been responsible. Moreover, a substantial proportion of the firms involved are locally owned. Accordingly, the factor of fluctuating external markets for particular semi-processed local goods would appear to emerge yet again as a prominent force in manufacturing adjustments in the Launceston economy.

Thus, for the period 1968-69 to 1980-81 as a whole, three key features have arisen from an analysis of the most recent evolutionary period of the Launceston manufacturing economy which embraces the phase of most substantial adjustment in the national economy:

(i) The structure of the local economy was such that the effect of major negative national trends were a considerable force in local change, especially as it related to Textile and, to a lesser extent, Transport equipment manufacture; However,

(ii) Competitive effects in aggregate emerged as being exceptionally disadvantageous to Launceston manufacturing as a result of two factors:

(a) Fluctuation in external markets for semi-processed goods leading to considerable instability at the sub-divisional level rather than reflecting national trends in general, affecting food products and timber products in particular; and

(b) The incidence of sub-divisional domination in some cases by few large operations of multinational companies for which effective control emanates from the national core, and perhaps even outside the nation. Centralised decision making aimed at curtailing activities in times of global recession is likely to be implemented in the more peripheral locations such as Launceston, and this aspect appears important to Textile and Transport equipment manufacture; And

(iii) An important diversification in the local economy occurred which was not entirely the result of relative adjustments as

a result of changes elsewhere in the structure. Whilst net competitive effects were negative, considerable variability within the manufacturing sector was evident and, indeed, during the period of maximum impact of the recession (1972-73 to 1977-78), trends in some Launceston sub-divisions were the opposite of those being experienced nationally. Gains continued in the ensuing period for Fabricated metal products and Other machinery and equipment production, resulting in their emergence as important components of the local structure. Interestingly, change of this form is quite out of character in relation to other peripheral areas in Australia where recent growth is based on Food, beverage and tobacco (in which Launceston is participating), and Basic metal products (in which the Launceston urban area is not participating, although the regional hinterland is) manufacture (Rich 1982). This can, therefore, be considered an important development in the local economy.

It is against the background of these changes that an analysis of the linkages of the Launceston manufacturing economy is to be undertaken. It is the manufacturing economy of a peripherally located provincial service centre, specialising essentially in resource based activity subject to considerable market instability, with a component of 'filtered down manufacturing'. Both of these components are still suffering the effects of adverse national trends coupled with the unfavourable effects of non-local

control. It also has a component of local service oriented activity operating to limited local demand, and in some cases to the still relatively limited and more dispersed statewide demand. It is with respect to the latter that growth potential in Launceston (already evident) appears most promising, aided by locational centrality and an associated transport infrastructure facilitating internal and external movement.

Thus, the structure of Launceston's manufacturing economy is not entirely consistent with the pattern of other Australian provincial service centres. Nonetheless, it does represent a useful example of a non-metropolitan environment within an essentially resource based region which is peripheral to major centres of concentrated manufacturing activity - an environmental context that has not as yet been subjected to detailed and comprehensive linkage analysis.

A1.3 Shift and share analysis.

Shift and share analysis is a technique used in analysing regional economic growth by comparing a region's growth rate for an economic variable with the growth rate of the same variable for a nation (or state). Although employment is most often used as a measure of economic activity for shift and share analysis, other variables, such as salaries and wages, and the value added by manufacture, may be used. For the purpose of further discussion of this technique, and for the analysis contained within this study, employment has been used as the variable.

In a critique of shift and share analysis, Houston has explained the technique as follows:

> The growth in a regional variable e.g. income, employment, output, is divided into three components, all of which depend in whole or part on national growth.... The analysis begins by identifying an aggregate national growth rate of all employment and asserts that all regions and sectors should have at least this much growth. This is the national growth component or the region's "share".
>
> The remaining growth represents a net gain or loss (or "shift") to the region. At the individual sector level, this shift can be due to: 1) compositional mix, or 2) competitive position (Houston, 1967, 577).

These terms have been conveniently simplified to the 'mix component' and 'competitive component' (Hoover, 1971, 293).

If a region's differential growth rate arises exclusively from 'mix', it is said to have experienced a 'pure mix effect', caused by 'the prevailing industrial structure of the area' (Lloyd and Dicken, 1972, 187). For example, if the region's share of the national total for each industry

remains the same over the period of time studied, it has a growth rate for each industry equal to that of the nation as a whole. Yet, if the region has mainly fast-growing industrial activities, its overall percentage growth rate will be greater than that of the nation, indicating a 'favourable growth mix'. In contrast, if the region has many slow-growing industries, its overall growth rate will be smaller than the national growth rate (Hoover, 1971, 293).

If the region's growth rate is produced solely by a greater rate of growth of the area's individual industrial activities than in the nation as a whole, it is said to have obtained this growth through the competitive component.

> We can evaluate the competitive component by imagining the case of a region that has exactly the same mix of activities as does the nation: its percentage share of the national total is the same for all activities. This region will have an overall growth rate higher than that of the nation if it increases its shares (that is, if each activity grows faster in the region than in the nation). Such a case represents the competitive component in isolation (Hoover, 1971, 293).

In reality, a region is likely to experience effects of both the 'mix' and 'competitive' components.

Basically, calculations in shift and share analyses involve the following steps: Initially, the rate of growth of employment in each given industry for the region is calculated over some defined period on an overall or national basis. Then, there is computed for each industry, the difference between the actual employment in the industry and the employment that would have resulted had the region's rate of growth in the

industry been the same as the national rate (Isard, 1960, 256). When these differences are totalled, it is possible to find the region's degree of divergence from the expected regional employment. 'A positive difference signifies a shift of industry into the region, while a negative difference indicates a shift out of the region' (Isard, 1960, 259).

The three major elements involved in the analysis are:

(i) The national growth element (N.G.E.), which is calculated by multiplying the total employment in industry for the region at the beginning of the period by the national growth rate expressed as a percentage for the time period covered. This shows the change expected in the region if total employment had increased at the national rate.

(ii) The industry mix effect (I.M.E.) is calculated by subtracting the national growth element from the total of the expected changes for each industry group. When calculated, it shows the expected effect of differences from the national average in the industrial mix of the region. Thus, N.G.E. plus I.M.E. equals the total expected change in the region.

(iii) The regional competitive effect (R.C.E.) is found by subtracting the expected change (industry mix effect plus national growth element) from the actual total change in employment. As such it indicates the total unexpected change.

APPENDIX 2

THE DEFINITION OF FIRM ATTRIBUTE SUBSETS OF LAUNCESTON MANUFACTURERS

Given the importance of attributes of firm character to the linkage objectives of the study (Refer Section 1.4), this appendix is designed to provide specific information on the structure of the survey responses dealing with firm character, and the modification of these for use in the analyses of linkage.

2.5 The definition of firm attribute subsets of Launceston manufacturers.

Categorisation of the attributes of firm character is based on standard definition and/or established classifications with minimal modification where possible. In some cases, however, the delimitation of categories poses difficulties to the extent that standard procedures tend to cloud some internal variation. The systematic approach of equal class sizes or equivalent attribute ranges are equally inappropriate, the former clouding the potential impact of the relatively few Launceston firms at extreme ends of a continuum and the latter tending to concentrate the majority of firms at one or other end of a continuum. The ultimate determination is somewhat arbitrary, based on a compromise between the desire for approximately equal sized categories where possible, whilst maintaining consideration for the obvious impact the smaller number of firms at one end of a range may have on linkage patterns.

The structures adopted for subsequent analyses, treated sequentially in the order discussed in Section 1.3, are as follows:

1. Size of operation: The problems referred to above are particularly evident with respect to this attribute. Since all manufacturing firms in Launceston are included, there is a preponderance of small firms. But the obvious impact of the few large firms had to be accounted for. Thus, the categories adopted for employment and turnover (Tables A2.1 and A2.2) are designed to emphasise this predominance of small to medium sized firms in Launceston, yet at the same time permit an assessment of the impact on linkage patterns of the few large firms - those responsible for a greater overall impact on the Launceston economy because of their substantial contribution to employment and the generation of revenue.

Table A2.1: Employment size categories for linkage analysis.

Survey responses			Categories for analysis		
Employment	No. of firms	Percentage of firms	Employment	No. of firms	Percentage of firms
1-4	50	28.6	1-4	50	28.6
5-9	37	21.1	5-9	37	21.1
10-24	40	22.9	10-24	40	22.9
25-49	26	14.9			
50-74	5	2.9	25-99	34	19.4
75-99	3	1.7			
100-149	5	2.9			
150-199	2	1.1	100-999	14	8.0
200-499	5	2.9			
500-999	2	1.1			
>1,000	0	0			
TOTAL	175	100		175	100

Source: Launceston manufacturing survey, 1980.

Table A2.2: Annual turnover categories for linkage analysis.

Survey responses			Categories for analysis		
Turnover ($)	No. of firms	Percentage of firms	Turnover ($)	No. of firms	Percentage of firms
<50,000	13	8.0			
50-75,000	13	8.0	<100,000	38	23.3
75-100,000	12	7.4			
100-250,000	29	17.8	100-250,000	29	17.8
250-500,000	28	17.2	250-500,000	28	17.2
500- 1 mil.	21	12.9	500-1 mil.	21	12.9
1-2 million	23	14.1	1-2 million	23	14.1
2-5 million	12	7.4			
5-10 million	4	2.5	>2 million	24	14.7
>10 million	8	4.9			
TOTAL	163[1]	100		163[1]	100

1. No reply from 12 firms
Source: Launceston manufacturing survey, 1980.

2. Length of establishment: Five categories of length of establishment are used, identifying those operations which were established before the Second World War as the well entrenched, long term operations, and at the other extreme those which were developed within the preceding decade. The latter period is divided into intervals of five years to segregate the most recent category because of the high incidence of closure within the developmental phase of many small businesses (Table A2.3).

Table A2.3: Date of establishment categories for linkage analysis.

Date	No. of firms	Percentage of firms
Pre 1945	46	26.3
1945 - 59	48	27.4
1960 - 69	35	20.0
1970 - 75	27	15.4
1976 - 80	19	10.9
TOTAL	175	100

Source: Launceston manufacturing survey, 1980.

3(a) Position in the chain of operations as defined by nature of input: Five categories of nature of input were coded for the survey, of which the use of predominantly semi-manufactured inputs is pre-eminent (Table A2.4). The remaining categories account for very few firms and some form of amalgamation is necessary. Since manufacturing based on unprocessed inputs frequently necessitates the use of semi-manufactured inputs also, responses (1) and (2) from Table A2.4 are combined. For similar reasons, responses (4) and (5) are amalgamated. This results in three categories for subsequent analysis representing essentially processing, fabricating and assembly activities.

Table A2.4: Nature of input categories for linkage analysis.

Survey responses			Categories for analysis		
Nature of input	No. of firms	Percentage of firms	Nature of input	No. of firms	Percentage of firms
1. Predominantly[1] unprocessed	13	7.4	Predominantly unprocessed	20	11.4
2. Predominantly unprocessed + semi-manufactured	7	4.0			
3. Predominantly semi-manufactured	146	83.4	Predominantly semi-manufactured	146	83.4
4. Predominantly fabricated components	5	2.9	Predominantly fabricated components	9	5.2
5. Predominantly fabricated + semi-manufactured	4	2.3			
TOTAL	175	100		175	100

1. Predominantly is defined as ≥ 60% of total value of inputs.

Source: Launceston manufacturing survey, 1980.

3(b) Position in the chain of operations as defined by nature of output: Nature of output is less easily categorised due to the level of product diversification within many of the Launceston manufacturing operations (Table A2.5).

Table A2.5: Nature of output categories for linkage analysis.

Survey responses			Categories for analysis		
Nature of output	No. of firms	Percentage of firms	Nature of output	No. of firms	Percentage of firms
1. Predominantly[1] semi-manufactured	11	6.3	Predominantly semi-manufactured	11	6.3
2. Predominantly fabricated component to manufacturer	1	0.6	Predominantly fabricated components	38	21.7
3. Predominantly fabricated component to non-manufacturer	37	21.1			
4. Predominantly final product	102	58.3	Predominantly final product	102	58.3
5. Predominantly final product + component	15	8.6	Other	24	13.7
6. Predominantly sub-contract manufacture	1	0.6			
7. Other combinations	8	4.6			
TOTAL	175	100		175	100

1. Predominantly is defined as ≥ 60% of total value

Source: Launceston manufacturing survey, 1980.

On the basis of the limited number of cases involved in the production of fabricated components for other manufacturers (response 2, N = 1) all production of fabricated components is combined within the one category regardless of the character of the subsequent purchasing sector. There are also a number of firms not readily allocated to one or other of the major categories because of various combinations of product, the most frequent being the combination of final product plus fabricated component to non-manufacturer. For ease of analysis, these are grouped into a category identified as 'Other', together with the single case entirely involved in the provision of a sub-contract manufacturing service.

Thus, discrimination beyond the usual tripartite semi-manufactured/fabricated component/final product division is not possible for Launceston manufacturers.

3(c) Industrial classification: The industrial classification adopted for the analysis of Launceston's manufacturing linkages closely parallels the Australian Standard Industrial Classification (1969) sub-divisions. Because of the limited presence of operations engaged in Basic metal products, Household appliances and Plastic products manufacture, these are included with the category 'Other manufacturing' for the linkage analysis (Table A2.6).

Table A2.6: Industrial classification categories for linkage analysis.

Industrial categories	No. of firms	Percentage of firms
1. Food and beverages	24	13.7
2. Textiles	5	2.8
3. Clothing and footwear	4	2.3
4. Wood, wood products and furniture	49	28.0
5. Paper, paper products and printing	14	8.0
6. Chemical, petroleum and coal products	10	5.7
7. Glass, clay and non-metallic mineral products	8	4.7
8. Fabricated metal products	44	25.2
9. Transport equipment	6	3.4
10. Other industrial machinery and equipment	6	3.4
11. Other manufacturing[1]	5	2.9
TOTAL	175	100

1. Other manufacturing includes Basic metal products (N = 1), Household appliances (N = 1) Plastic products (N = 1) and the manufacture of signs (N = 2)

Source: Launceston manufacturing survey, 1980.

With respect to the analysis of input linkages specifically, an additional attribute of firm character is assessed based on the industrial origin of the major input. The classificatory structure and the distribution of firms therein is shown in Table A2.7.

Table A2.7: Industrial origin of input categories for linkage analysis.

Industrial categories	No. of firms	Percentage of firms
1. Food and beverages	18	10.3
2. Textiles	15	8.6
3. Wood and wood products	35	20.0
4. Paper and paper products	12	6.9
5. Chemical, petroleum and coal products	16	9.1
6. Glass and cement products	5	2.9
7. Basic metal products	52	29.7
8. Fabricated metal products	4	2.3
9. Other semi-manufactured products[1]	4	2.3
10. Primary sector products[2]	14	8.0
TOTAL	175	100

1. Other semi-manufactured products include Transport equipment (N = 1), Leather products (N = 1) and Plastic products (N = 2).
2. Primary sector products include those from the Agricultural (N = 8), Forestry (N = 4) and Mining (N = 2) sectors.

Source: Launceston manufacturing survey, 1980.

4(a) Operational technology: Batch and unit production are the most common modes of operation among Launceston manufacturers, readily forming separate categories for analysis. However, the number of firms operating both batch and unit processes is such that this combination is also used as a discrete category (Table A2.8). The nine firms not engaged in batch and/or unit production share the common characteristic of continuous production of a standardised product, whether it be small or large scale.

The small scale continuous producers are both capital intensive in their operation but the level of investment is directly related to the size of the Tasmanian market, hence the reduced scale. The three continuous operations engaging in some batch production do this as a spin-off from the manufacture of their principal product, with two of them actually using by-products. These nine firms are grouped as continuous, standardised producers for subsequent analysis.

Table A2.8: Operational technology categories for linkage analysis.

Survey responses			Categories for analysis		
Production process	No. of firms	Percentage of firms	Production process	No. of firms	Percentage of firms
Large scale, continuous	4	2.3	Continuous, standardised production	9	5.1
Small scale, continuous	2	1.1			
Large scale, continuous, + batch	3	1.7			
Batch production	75	42.9	Batch production	75	42.9
Unit production	63	36.0	Unit production	63	36.0
Batch plus unit production	28	16.0	Batch plus unit production	28	16.0
TOTAL	175	100		175	100

Source: Launceston manufacturing survey, 1980.

4(b) Functional specialisation in the labour force: Given the character of Launceston's manufacturing economy, categorisation of functional specialisation in employment is dominated by differentiation based on the more routine functions (Table A2.9). Virtually no functional specialisation exists in categories (1) and (2). The distinction is made in terms of whether the owner/manager is actively involved as a process worker, or operates as a foreman/supervisor. Category (4), management/sales/process specialisation, is included because of the special circumstances pertaining to small operations, similar in character to

category (2), but with an attached retail outlet/shop front for the sale of their product direct to the public. High levels of specialisation in the larger operations, categories (5) and (6), are differentiated on the basis of specialisation within the management function. In both of these functionally specialised categories there is specialisation in each of the management/clerical/sales/process sub-divisions, plus varied combinations of other functions such as transport, stores, maintenance, cleaning and so on. Yet, it is in category (6) alone that any specialisation of the management function exists, permitting internal devolution of responsibility.

Table A2.9: Functional specialisation in the labour force categories for linkage analysis.

	Degree of specialisation	No. of firms	Percentage of firms
1.	No functional specialisation	54	30.9
2.	Owner/manager + process	19	10.9
3.	Management, clerical, process	29	16.6
4.	Management, sales, process	7	4.0
5.	Specialisation in most categories	35	20.0
6.	Specialisation in all categories, including various management functions	31	17.7
	TOTAL	175	100

Source: Launceston manufacturing survey, 1980.

4(c) Ownership structure: On the basis of the research findings referred to in Section 1.4, it is considered that the key characteristic likely to be responsible for major variations in linkage patterns will be the dichotomy of independent (single company) operations versus groups of

companies. Each of these are further sub-divided, independent operations on the basis of the presence or absence of a board of directors; and the more complex corporate structures on the basis of the presence or absence of the controlling company in Launceston. Whether company directors are responsible to shareholders who had purchased privately, or publicly through the stock exchange, is not expected to be an important differential in linkage behaviour. Thus, the format of the attribute ownership structure adopted for this study (which is detailed in Table A2.10) is as illustrated in Figure A2.1.

Table A2.10: Ownership categories for linkage analysis.

Survey responses			Categories for analysis		
Form of ownership	No. of firms	Percentage of firms	Form of ownership	No. of firms	Percentage of firms
Sole ownership	13	7.4	Sole ownership/partnership	74	42.3
Partnership	61	34.9			
Registered company - private	52	29.7	Registered company	56	32.0
Registered company - public[1]	4	2.3			
Group subsidiary - private	9	5.1	Group of companies - based outside Launceston	35	20.0
Group subsidiary - public[1]	26	14.9			
Launceston group - private	5	2.9	Group of companies - Launceston based	7	4.0
Launceston group - public[1]	2	1.1			
Other[2]	3	1.7	Other	3	1.7
TOTAL	175	100		175	100

1. Publicly owned companies are those in which share capital is listed for trading on the stock exchange.
2. The other category includes a local government enterprise, a state government enterprise and an independent, registered company involved in a joint venture with an organisation based outside Launceston.

Source: Launceston manufacturing survey, 1980.

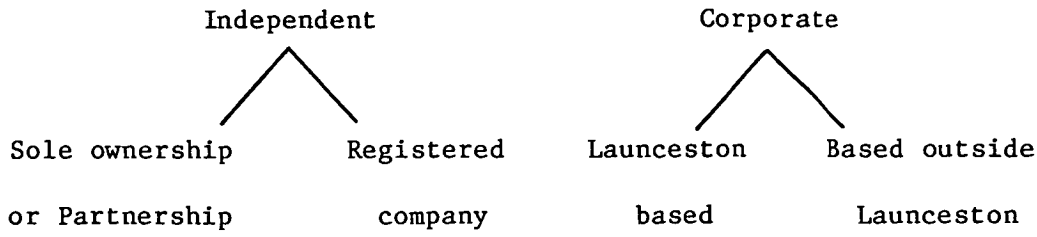


Figure A2.1: The format of the attribute ownership structure used in the linkage analyses.

4(d) Location of control: Whilst an element of the notion of an attribute relating to local/non-local control is incorporated into two of the categories of ownership structure, it is not complete. This is formalised by the adoption of a discrete attribute concerned with the precise regional location of the controlling office for the Launceston operation which permits penetration of the relationships further than a simple local versus non-local dichotomy. Evidence indicated earlier (Refer Section 1.4) clearly demonstrates that decisions made within the local environment, and those increasingly distant, have differing repercussions for the spatial extension of linkages.

An analysis based on the location of the controlling office, defined as the office with effective control of the Launceston operation, is preferred because of the complexity of the relationships involved amongst ultimate/Australian/divisional/regional head offices. Certainly, an analysis based on the ultimate head office which may be located overseas, or one which monitors a number of divisions, exerting little direct influence other than at high level decision making such as major investment, seems inappropriate. The location of the Australian head office may have been a useful measure, yet the problem of ascertaining effective

control over one of possibly a number of divisions within a large corporation, and the devolution of this control through regional offices, could itself be the subject of a separate study.

Thus, the office with effective control for the Launceston operation, whatever its status, is utilised as the basic unit for subsequent linkage analysis. Accordingly, the status of the controlling offices is quite varied, from the ultimate head office of firms, through a hierarchy of regional head offices: the Australian head office (total or divisional), the Victorian/Tasmanian head office and the Tasmanian head office (total or divisional). Interestingly, only two of the ten controlling offices located in Tasmania are in fact the head office of Tasmanian based organisations (Table A2.11). The remaining eight are regional head offices (Tasmania), responsible to higher order head offices in Victoria or New South Wales. Such supplementary information, whilst not forming the core of the subsequent analyses dealing with this aspect, is nonetheless drawn upon for the discussion of particular linkage patterns.

Table A2.11: Location of control categories for linkage analysis.

Survey responses			Categories for analysis		
Location of controlling office	No. of firms	Percentage of firms	Location of controlling office	No. of firms	Percentage of firms
Launceston only operations	127	72.6	Launceston	139	79.4
Launceston head office	10	5.7			
Launceston operation independent	2	1.1			
N.W. Tasmania	2	1.1	N.W. Tasmania	2	1.1
Southern Tasmania	8	4.6	Southern Tasmania	8	4.6
Victoria	22	12.6	Victoria	22	12.6
N.S.W./A.C.T.	3	1.7	Elsewhere Australia	4	2.3
W.A./S.A.	1	0.6			
	175	100		175	100

Source: Launceston manufacturing survey, 1980

In addition to the 127 firms operating in Launceston only, a further 12 firms with activities located beyond the city are either controlled by the Launceston head office (N=10), or the Launceston office is completely independent of the remainder of the organisation (N=2). These are grouped as Launceston controlled operations for the linkage analyses. For the remaining 36 externally controlled firms, control from individual Tasmanian regions are treated as separate categories, as are the 22 operations directly controlled from Victoria. More distant control is amalgamated as 'Elsewhere in Australia'.

The combination of the 12 Launceston controlled multi-locational firms and the 127 firms operating from Launceston only prevents a potentially useful dichotomy closely related to the single versus multi-plant division identified in Section 1.4 as being used in linkage studies. Moreover, local operations of multi-locational firms assume a very important role in the structure of the Launceston manufacturing economy (Refer Chapter 3). However, the multi-locational character of a distinctive subset of firms (N=48), and the impact of this for linkage behaviour, particularly the potential for intra-firm transfers, is considered sufficiently important to keep the group clearly identified in the analyses. This is accomplished by the separate identification of the component of regional linkages resulting from intra-firm transfers for each category of each of the attributes investigated. Note, however, this form of discrimination does not apply to the Launceston urban area since the operational unit is the whole of the Launceston operations of the firm.

4(e) Autonomy in decision making: The technique adopted for this component of the study is based on that used by Marshall (1979). Management autonomy is assessed in relation to production, marketing, financial, employment and specialist service functions; and the specific decisions identified within each of the functional categories are listed in Table A2.12.

To ascribe some measure of local autonomy in decision making for the 36 externally controlled firms, each of the individual facets of management decision making activity is coded as:

(i)- a local decision;

(ii)- the decision was made in consultation with, or based on a recommendation to, a higher level office; and

(iii)- the decision was entirely external to the local operation.

Table A2.12: Operational functions assessed for the degree of local autonomy in decision making.

Production	Marketing
Product design	Pricing policy
Level of output	Sales promotion
Purchase of materials-source	
Purchase of materials-price	**Financial**
Level of stock	Capital investment
Choice of sub-contractors[1]	Major loans
Employment	
Replacement	**Specialist services**
Expansion	Suppliers for ancillary services
Retrenchment	Suppliers for professional services
Wage and salary adjustment	
Executive recruitment	

1. Since only three of the 36 externally controlled operations utilise sub-contract manufacturing services, this activity is not considered in subsequent analyses.

Values are summed for all activities as a composite measure, and for each of the five functional categories separately. For the linkage analyses, the range for each of these six data sets are divided into three subsets, with consideration being given to both natural breaks in the frequency distribution and approximately equal value ranges where possible. The subsets represent decision making largely internal to the local operation, intermediate, and largely external (Table A2.13).

Table A2.13: Autonomy in decision making categories for linkage analysis.

Functional category	Degree of autonomy						Total
	Largely internal		Intermediate		Largely external		
	No. of firms	Percentage of firms	No. of firms	Percentage of firms	No. of firms	Percentage of firms	
Production	22	61.1	7	19.4	7	19.4	36
Marketing	10	27.8	15	41.7	11	30.6	36
Financial	0	0.0	7	19.4	29	80.6	36
Employment	5	13.9	21	58.3	10	27.8	36
Specialist services	16	44.4	20	55.6	0	0.0	36
Composite measure	8	22.2	23	63.9	5	13.9	36

Source: Launceston manufacturing survey, 1980.

Finally, a multi-dimensional attribute of firm character, which has been defined and sub-divided into its constituent categories in a classification of firms (Refer Chapter 3), is used in order to provide some indication of the overall impact of the character of Launceston's firms on linkage behaviour.

APPENDIX 3

DETAILS OF THE LAUNCESTON MANUFACTURING SURVEY

A3.1 Schedule A: Launceston operations of multi-locational firms.

TASMANIAN COLLEGE OF ADVANCED EDUCATION

NEWNHAM

DEPARTMENT OF GEOGRAPHY

SURVEY OF THE MANUFACTURING INDUSTRY

IN URBAN LAUNCESTON 1980

CASE NO. _____

NAME OF FIRM _____

ADDRESS OF THESE PREMISES _____

NAME OF PERSON INTERVIEWED _____

POSITION IN FIRM _____

DATE OF INTERVIEW _____

CASENO [ ][ ][ ] (1 - 3)

Are there any branches/subsidiaries of the firm/controlling company located outside Launceston?

1. [ ] YES → Use schedule A

2. [ ] NO → Use schedule B

FILENO [ ] (4)

SCHEDULE A. FIRMS WHICH OPERATE BRANCHES LOCATED OUTSIDE LAUNCESTON

The main purpose of this survey is to gather information on the nature and organisation of manufacturing in the city. Of particular interest is the way in which firms interact via such things as purchases and sales with other concerns, including those located elsewhere in Tasmania and on the mainland.

I would like to begin by discussing the nature of the entire activities of your firm in Launceston, bearing in mind however that the primary focus is on manufacturing.

The survey is concerned with the WHOLE OF THE LAUNCESTON OPERATION, thus separate local plants are to be treated collectively.

1. (a) In general terms, what are the major activities of the firm in Launceston? (CARD 1)

   (b) Could you indicate the importance of each activity in terms of its % share of the total turnover for the Launceston operations of the firm for the last financial year. (CARD 1)

When considering the relative proportions in each category, it is important that any on-site activities undertaken subsequent to the actual manufacturing process such as building/ construction or installation/maintenance/repair for other concerns be separated from the manufacturing activity and included in the appropriate category.

	RANK	% SHARE OF TOTAL TURNOVER	
1.			Manufacture
2.			Sub-contract manufacture (CARD 1)
3.			Wholesale of other goods
4.			Retail of other goods
5.			Transport and Storage of goods for other firms or public
6.			Installation, Maintenance and Repair of equipment
7.			Building and Construction
8.			Management/professional services for other firms
9.			Other (please state): _____

MFR
SCMFR
WSALE
RETAIL
TRANS
IMR
BANDC
MANPROF
OTHERACT
5 - 22

2. Since my concern is manufacturing, I would like to look at those activities in more detail. In particular:

   (a) What are the major products (or groups of related products) manufactured by the firm in Launceston? (CARD 2)

   If response in terms of product group(s), specify any particular product which accounts for greater than 50% of total turnover.

   (b) Could you indicate the importance of each product (or product group) in terms of its % share of manuf. sales of the Launceston operation for the last financial year?

   (c) Which of the following categories best describes the nature of each of the major products (or product groups)? (CARD 2)

	PRODUCT/PRODUCT GROUP	% SHARE OF MANUF. SALES	PRODUCT CATEGORY
1.			
2.			
3.			
4.			
5.			

Code major product group as per Card 2

PRODGP
23 - 25

PRODSPEC
26

POSOP 1
27

Degree of Specialisation

1. Single product
2. Single product group, major product > 50%
3. Single product group, no product > 50%
4. More than one group, major product > 50%
5. More than one group, no product > 50%

Product Category

1. Predom. semi-manufactured goods
2. Predom. fabricated components
3. Predom. final product
4. Predom. sub-contract manufacture
5. Other (please state)

3. (a) Which of the following best describes the level at which the production process of this firm operates in Launceston? (CARD 3)

1. ☐ Large scale assembly line/mass production (i.e. continuous standardised production
2. ☐ Batch production (i.e. limited production runs which vary according to nature of order(s)
3. ☐ Small scale unit production or 'jobbing' for specialised orders
4. ☐ Other, including any combination of the above (please specify): _____

OPMODE ☐ 28

(b) Is the Launceston operation engaged in research and development of:

(i) new products involving the manufacture of prototypes?

1. ☐ YES
2. ☐ NO

(ii) new production process technology?

1. ☐ YES
2. ☐ NO

PRODEV ☐ 29 TECHDEV ☐ 30

(c) On how many premises does the firm operate in Launceston?

		No. of premises			No. of premises
1.	☐	1	3.	☐	3
2.	☐	2	4.	☐	More than 3

PREMNO ☐ 31

4. Which of the following best describes the organizational and ownership structure of the firm? (CARD 4)

1. ☐ Sole ownership
2. ☐ Partnership
3. ☐ Single registered company - privately owned
4. ☐ - publicly owned
5. ☐ A group of companies, this firm a subsidiary - privately owned
6. ☐ - publicly owned
7. ☐ A group of companies, L'ton management controls subsidiaries - privately owned
8. ☐ - publicly owned
9. ☐ Other (please state): _____

OWNSH ☐☐ 32 33

5. (a) Which of the following best describes the establishment of the original operations in Launceston? (CARD 5)

1. ☐ Originated and developed in the local environment
2. ☐ Relocated in Launceston from elsewhere
3. ☐ Established as a branch/subsidiary of a firm based elsewhere in Tasmania
4. ☐ Established as a branch/subsidiary of a Mainland based firm
5. ☐ Established as a branch/subsidiary of an Overseas based firm
6. ☐ Other (please state): _____

ORIGIN ☐ 34

(b) Is the present organisational and ownership structure of the Launceston operation the result of any change that has occurred since establishment of the original operations?

1. ☐ YES IF YES, please specify form of takeover: _____
2. ☐ NO

NOWNSH ☐ 35 TAKFORM ☐☐ 36 37

(c) When did the firm commence operations in Launceston? If takeover/merger, indicate the date of establishment of the existing operation (if known) and the takeover date.

DATE: (i) existing operation _____
(ii) takeover _____

1. ☐ pre 1945
2. ☐ 1945 - 59
3. ☐ 1960 - 69
4. ☐ 1970 - 75
5. ☐ 1976 - 80

ESTDATE ☐ 38 TAKDATE ☐ 39

(d) (i) In which of the following areas is the office with effective control of these operations located? (CARD 5a)

(ii) How many other branches/subsidiaries are responsible to this controlling office in each of the following areas?

(iii) Is this controlling office the ultimate Head Office for the entire firm/group; or an intermediate Australian Head Office, Victorian/Tasmanian Head Office, Tasmanian Head Office or the major office for N. Tasmania?

If an intermediate office, where is the ultimate Head Office for the entire firm/group of companies located?

Location	No.	Location of controlling offices
TASMANIA		
01 Urban Launceston		
02 N. & N.E. Tas.		
03 N.W. & W. Tas.		
04 S. Tas.		
05 Tas. unspecified		
MAINLAND		
06 Victoria		
07 N.S.W./A.C.T.		
08 W.A./S.A.		
09 Qld./N.T.		
10 Mainland unspecified		
11 OVERSEAS (please specify nation if H.O. is located overseas): _____		

Office Category:
1. Ultimate H.O.
2. Australian H.O.
3. Vic/Tas. H.O.
4. Tasmanian H.O.
5. Major office N. Tas.

CONTOFF 40 41

OFFCAT 42 43

ULTHOLOC 44 45

BRANNO 46 47

BRAN
L
N
NW
S
T
M_1
M_2
M_3
M_4
M
O
48-58

(e) IF LAUNCESTON IS NOT HEAD OFFICE,

(i) Where are the management decisions made for each of the following aspects of the Launceston operations? (CARD 5a) Code location: as above, plus 77. Local recommendation. Code office category: 1-5 as above, plus 6. This office; 7. Local recommendation.

IF LAUNCESTON OFFICE PERFORMS ANY MANAGEMENT FUNCTIONS FOR OTHER BRANCHES,

(ii) Which of the following management decisions does the Launceston office make for branches located elsewhere? Specify the area in which these branches are located. (CARD 5a)

Code: 1. N.E. Tas. 2. N. Tas. 3. Tasmania 4. S.E. Australia 5. Australia 6. Australia and Overseas 7. Other 8. Branch decision

		Control over L'ton operation	Location of branches controlled by L'ton office
PRODUCTION:	- product design		
	- level of output		
	- purchase of inputs - source		
	- price		
	- level of stock		
MARKETING:	- pricing policy		
	- sales promotion		
FINANCE:	- capital investment		
	- major loans		
LABOUR FORCE:	- replacement		
	- expansion		
	- retrenchment		
	- wage and salary adjustment		
	- executive recruitment		
SPECIALIST SERVICES	- subcontracting		
	- choice of suppliers for ancillary services (CARD 7a)		
	- choice of suppliers for professional services (CARD 7a)		
OTHER (please state)	_____		

	DECOL	DECOC	LCONT
P_1			
P_2			
P_3			
P_4			
P_5			
M_1			
M_2			
F_1			
F_2			
LF_1			
LF_2			
LF_3			
LF_4			
LF_5			
SS_1			
SS_2			
SS_3			
OTH			
	59-94	95-112	113-130

6. (a) What was the total employment, including owners and managers, in the Launceston operation at the end of the last financial year (or at present if that is more convenient)?

For part-time workers, indicate the approximate total in terms of the number of equivalent full-time workers.

	No.
	Full time
	Part-time (total)
	Part-time (number of equivalent full-time)

	Total No.				
01		1 - 4	06		75 - 99
02		5 - 9	07		100 - 149
03		10 - 24	08		150 - 199
04		25 - 49	09		200 - 499
05		50 - 74	10		500 - 999
			11		> 1,000

EMP 131 132

(b) What was the number (or %) of the workforce in each of the following categories at the end of the last financial year (or at present if more convenient)? (CARD 6)

If a person has more than one function, or is a part-time employee, estimate the actual proportion of his/her time spent in each relevant category.

Category	No.	%
Management		
Sales		
Clerical		
Actual manufacturing process		
Transport		
Other (please state):		
e.g. stores, maintenance,etc		

1. Virtually no functional specialisation of work force
2. Owner/manager responsible for sales, clerical, plus process supervision
3. Management, clerical, process specialisation
4. Functional specialisation in most categories
5. Functional specialisation in all categories, including various management functions.

EMPSPEC 133

7. (a) In round figures, what was the total turnover of the Launceston operation for the last financial year? (CARD 7)

$ _____

		$			$
01		< 50,000	06		500,000 - 1M
02		50 - 75,000	07		1 - 2M
03		75 - 100,000	08		2 - 5M
04		100 - 250,000	09		5 - 10M
05		250 - 500,000	10		> 10M

TOTURN 134 135

(b) Approximately what % share of the entire firm's (group's) total turnover does this represent?

$ _____

SHARE 136 137

(c) What is the current replacement value of the capital investment in your operations (buildings, machinery, etc.) in Launceston? (CARD 7)

$ _____

		$			
01		< 50,000			
02		50 - 75,000	07		1 - 2M
03		75 - 100,000	08		2 - 5M
04		100 - 250,000	09		5 - 10M
05		250 - 500,000	10		10 - 25M
06		500,000 - 1M	11		> 25M

CAPINV 138 139

- 6 -

Now, could we focus on the sale of the products manufactured by the Launceston operation? The emphasis is on the areas in which sales are made. Firstly however,

8. (a) Which of the following best describes your usual sales procedure? (CARD 8)

(b) If more than one, indicate the importance of each procedure in terms of its % share of total sales by value.

	Rank	% Share of total sales	
1			Direct to other establishments of this firm/group for further manufacture.
2			Direct to other establishments of this firm/group for distribution
3			Direct to one particular manufacturing firm
4			Direct to a number of manufacturing firms
5			Direct to construction firms
6			Direct to one particular wholesaler
7			Direct to a number of wholesalers
8			Direct to retailers (i.e. firm does own wholesaling)
9			Direct to any other firm(s). State nature of firm: _____
10			Direct to government agencies
11			Direct to public (i.e. firm does own wholesaling and retailing)
12			Other (please state): _____

General code:

1. Sales to one specific firm
2. Sales to firms of one particular industrial group
3. Sales to a restricted combination of groups
4. No uniformity in sales procedure
5. Direct to other branches of firm

SBMFR
SBDIST
SMFR
SMFRS
SCONSTR
SWHOL
SWHOLS
SRET
SOTHFIR
SGOV
SPUB
SOTHER
140 - 163

SPROC
164

9. Without considering the manufacturing services taken on as sub-contract work:

(a) In which of the following areas are your products sold? (CARD 9 and 9a)

(b) What is the approximate % share of total sales by value made to your immediate customer/agent in each of these areas? (Specify those that are other establishments of this firm/group for each of the areas outside Launceston).

(c) Are the sales to any of these areas restricted to one particular product or to a limited number of the Launceston operation's range of products? If so, please identify.

(d) Please indicate if the sales to any of these areas are dominated by one or very few specific buyers; and if so, whether they are a manufacturer, wholesaler, government department or other (please state).

AREA	% share total sales		Part of prod.range (if applic.)		Restricted range of buyers			
	Own firm	Other	Own firm	Other	Manuf.	W/S	Govt.	Other
TASMANIA								
Urban Launceston	N/A		N/A					
Rest of N. & N.E. Tas.								
N.W. & W. Tas.								
S. Tasmania								
Tasmania unspecified								
MAINLAND								
Victoria								
N.S.W./A.C.T.								
W.A./S.A.								
Qld./N.T.								
Mainland unspecified								
OVERSEAS								
UNALLOCATED TOTAL								

Part of product range
1. Single product of range
2. Limited number of range of products
3. Virtually all firm's products
4. N/A, i.e. all firm's products

Range of buyers
1. Restricted, manufacturer
2. Restricted, wholsaler
3. Restricted, Government agency
4. Restricted, other
5. N/A, i.e. no variation to usual sales procedure

	SALE	PRORA	BUYRA
L			
N			
NW			
S			
T			
M_1			
M_2			
M_3			
M_4			
M			
O			
UNA			
	165-188	189-199	200-210

	SALE	PRORA
NB		
NWB		
SB		
TB		
M_1B		
M_2B		
M_3B		
M_4B		
MB		
OB		
	211-230	231-240

(e) (i) What is the % share of total sales to wholesalers in Launceston? _____ %

LSALWHOL 241 242

(ii) do you have any knowledge of the general area in which your products are distributed by them? If yes, please provide details.

1		No knowledge	4		Nationally
2		N. & N.E. Tasmania	5		Internationally
3		State wide	6		Other (please state) _____

WHOLDIS 243

10. For manufacturing services taken on as sub-contract work in Launceston:

(a) what is the nature of the sub-contracting process(es)?

(b) could you indicate the importance of each process in terms of its % share (by value) of all sub-contracting for the last financial year?

SCONGP 1 244 - 246

	SUB-CONTRACT PROCESS (e.g. plating, heat treatment, specialist welding ...)	% share
1		
2		
3		
4		
5		
.		

Range of processes
1. Single process
2. Single group of related processes
3. Variety of processes spanning more than one product group
4. Other

PROCRA 1 247

11. (a) In which of the following areas are there concerns for whom the Launceston operation provides a sub-contracting service? (CARD 9 and 9a)

(b) What is the approximate % share of total sub-contracting revenue derived from each of these areas? (Specify that derived from other establishments of this firm/group for each of the areas outside Launceston).

(c) Is the sub-contract work to any of these areas restricted to one particular process or a limited number of the Launceston operation's range of processes? If so, please identify.

(d) Please indicate if the sub-contract work to any of these areas is primarily for one or very few specific customers; and if so, whether they are an associated manufacturer (same product category as this firm), other manufacturer, or a non-manufacturing concern (please identify).

AREA	% share of total sub-contract revenue		Specific process(es) (if applicable)		Restricted range of customers		
					Ass. Manuf.	Other Manuf.	Non-Manuf.
	Own firm	Other firms	Own firm	Other firms			
TASMANIA	N/A		N/A				
Urban Launceston							
Rest of N. & N.E. Tas.							
N.W. & W. Tas.							
S. Tas.							
Tas. unspecified							
MAINLAND							
Victoria							
N.S.W./A.C.T.							
W.A./S.A.							
Qld./N.T.							
Mainland unspecified							
OVERSEAS							
Unallocated total							

SCON 1 / SPPR 1 / CUSRA

L, N, NW, S, T, M_1, M_2, M_3, M_4, M, O, UNA

248-271 272-282 283-293

SCON 1 / SPPR 1

NB, NWB, SB, TB, M_1B, M_2B, M_3B, M_4B, MB, OB

294-313 314-323

Range of Processes
1. Single process of range
2. Limited number of range of processes
3. Virtually all firm's processes
4. N/A, i.e. all processes

Next I would like to focus on the inputs brought into the Launceston operation for the manufacturing process.

12. (a) What are the major inputs (or perhaps groups of related inputs) brought in for manufacturing? (CARD 2)

Include process related inputs, i.e. essential to the operations yet not forming part of the final product such as energy, packaging, sand ....; but do not include goods supplied by other concerns for whom you were providing a sub-contracting function.

(b) Could you indicate the importance of each input (or input group) in terms of its % share of the total value of all inputs for the last financial year?

(c) Which of the following categories best describes the nature of each of the major product related inputs used? (CARD 10)

	INPUT/INPUT GROUP	% SHARE	INPUT CATEGORY
1.			
2.			
3.			
4.			
5.			
	Energy		
	Packaging material		
	Other process related inputs		

Product groups
As per Card 2

Input Category
1. Predom. un-processed raw material
2. Predom. semi-manufactured goods
3. Predom. fabricated components

Degree of diversity of product related inputs
1. Dominated by one input
2. Dominated by group of related inputs
3. Wide range of inputs

(d) What % share of total manufacturing costs (i.e. all costs in producing and selling) do these inputs represent? _____%

13. *For all input requirements (including process related inputs) but not goods supplied by other concerns for whom you provide a sub-contracting function:*

(a) From which of the following areas do you purchase your inputs? (CARD 9)

(b) What is the approximate % share of total inputs by value obtained from each of these areas? (Specify those that are from other establishments of this firm/group in areas outside Launceston).

(c) Are the purchases from any of these areas restricted to one particular input or a limited number of the firm's range of inputs? If so, please identify, particularly in relation to energy, packaging and other process related inputs.

(d) Please indicate if the purchases from any of these areas are made because it is: (CARD 11)

1. the only available source
2. one of a number of satisfactory sources
3. the cheapest source
4. the most reliable source
5. better quality material
6. a group purchase
7. no particular reason
8. other (please state): _____

AREA	% share of total inputs		Part of input range if applicable		Reason for purchase in area	
	Own firm	Other firms	Own firm	Other firms	Own firm	Other firms
TASMANIA						
Urban Launceston	N/A		N/A		N/A	
Rest of N. & N.E. Tas.						
N.W. & W. Tas.						
S. Tas.						
Tas. unspecified						
MAINLAND						
Victoria						
N.S.W./A.C.T.						
W.A./S.A.						
Qld./N.T.						
Mainland unspecified						
OVERSEAS						
Unallocated total						

Part of input range
1. Single input
2. Limited number of range of inputs
3. Process related input only
4. Packaging material
5. Virtually all inputs
6. N/A, i.e. all inputs

INPGP
324 - 326

INPDIV
327

POSOP 2
328

INPEN
INPACK
INPROC
329 - 334

INPCOST
335 336

INP / INPRA / REPUR

L
N
NW
S
T
M_1
M_2
M_3
M_4
M
O
UNA

337-360 | 361 - 393 | 394-404

INP / INPRA / REPUR

NB
NWB
SB
TB
M_1B
M_2B
M_3B
M_4B
MB
OB

405-424 | 425 - 454 | 455-464

(e) (i) what is the % share of total purchases from wholesalers in Launceston? _____%.

(ii) do you have any knowledge of the initial source of the inputs by these wholesalers? If so, please provide details.

1.	No knowledge	4.	Mainland
2.	N. & N.E. Tas.	5.	Overseas
3.	Elsewhere in Tas.	6.	Other (please state) _____

LSUPWHOL 465 466

INITSUP 467

14. (a) When did the Launceston operation last purchase any major item of machinery or equipment?

1.	Pre 1960	3.	1970-75	Date: _____
2.	1960-69	4.	1976-80	

DMACHPUR 468

(b) Nature of machinery or equipment: _____

_____

MACHTYPE 469 470

(c) From which of the following areas was it (i) purchased, and (ii) manufactured? (CARD 9)

TASMANIA		MAINLAND	
01	Urban Launceston	06	Victoria
02	Rest of N. & N.E. Tas.	07	N.S.W./A.C.T.
03	N.W. & W. Tas.	08	W.A./S.A.
04	S. Tas.	09	Qld./N.T.
05	Tas. unspecified	10	Mainland unspecified
		11	OVERSEAS

AMACHPUR 471 472

AMACHMFR 473 474

(d) What was its approximate value? $ _____

		$			$
01		< 5,000	06		100-250,000
02		5-10,000	07		250-500,000
03		10-25,000	08		500-750,000
04		25-50,000	09		750,000 - 1M
05		50-100,000	10		> 1M

MACHVAL 475 476

(e) Where was the decision made to purchase this machinery or equipment?

1	Ultimate H.O.
2	Australian H.O.
3	Vic./Tas. H.O.
4	Tasmanian H.O.
5	Major office, N.Tas.
6	This office
7	Local recommendation, H.O. approval
8	Other (please state): _____

MACHDEC 477

(f) Was it purchased from another establishment of this firm/group?

1	YES
2	NO

BMACHPUR 478

The survey is also concerned with the extent to which services are provided for you by firms and offices in Launceston and elsewhere. I would like to consider first any manufacturing processes which you may sub-contract out, before looking at various ancillary services such as maintenance and repair, and management/professional services such as legal and financial advice.

15. (a) Do you sub-contract out for any manufacturing process? i.e. goods leave the Launceston operation for further processing by other firms (including branches of this firm located outside Launceston) and then return.

1 ☐ YES

IF YES, 2 ☐ NO

SCON 2 ☐ 479

(b) What specific process(es) do you sub-contract out?

(c) Could you indicate the importance of each process in terms of its % share (by value) of all subcontracting, for the last financial year?

SCONGP 2 ☐☐☐ 480 - 482

	SUB-CONTRACT PROCESS (e.g. plating, heat treatment, specialist welding ...)	% share
1.		
2.		
3.		
4.		
5.		

PROCRA 2 ☐ 483

SCONCOST ☐☐ 484 485

Range of Processes

1. Single process
2. Single group of related processes
3. Variety of processes spanning more than one product group
4. Other

(d) What % share of total manufacturing costs (i.e. all costs in producing and selling) do these sub-contract out processes represent? _____ %

16. (a) In which of the following areas are there firms to whom you sub-contract out? (CARD 9)

(b) What is the approximate % share of total sub-contracting costs paid out in each of these areas? (Specify that which is carried out by other establishments of this firm/group in each of the areas outside Launceston).

(c) Is the sub-contract work carried out in any of these areas restricted to one particular process or a limited number of processes required by the firm? If so, please identify.

(d) For each of these areas, is the sub-contract work undertaken for you on a regular (routine) basis, or irregularly such as situations related to special 'once off' jobs or as 'over-flows' when your firm is at capacity?

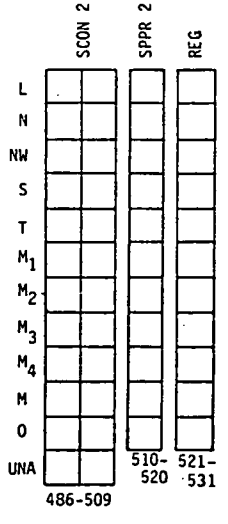
AREA	% share of subcontracting costs		Specific process(es) if applic.		Regularity	
	Own firm	Other firms	Own firm	Other firms	Own firm	Other firms
TASMANIA						
Urban Launceston	N/A		N/A		N/A	
Rest of N. & N.E. Tas.						
N.W. & W. Tas.						
S. Tas.						
Tas. unspecified						
MAINLAND						
Victoria						
N.S.W./A.C.T.						
W.A./S.A.						
Qld./N.T.						
Mainland unspecified						
OVERSEAS						
Unallocated total						

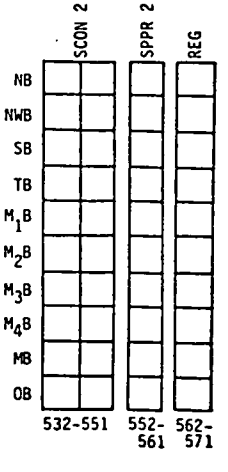
Range of Processes

1. Single process
2. Limited number of range of processes required
3. Virtually all of the processes required
4. N/A i.e. all processes required

Regularity

1. Regular
2. Irregular - special jobs
3. Irregular - overflow





17. Does the Launceston operation contract out to other establishments for any of the following ancillary services, i.e. related to the manufacturing process?

(a) IF YES,

(i) Indicate the degree (%) of the Launceston operation's self-sufficiency.

(ii) From which of the following areas do you obtain this service? (CARD 9)

(iii) What is the approximate % share of the total cost of this service from each of these areas? (Specify that which is provided by other establishments of this firm/group in each of the areas outside Launceston).

(b) Which of these are the most important in terms of the % share of the total cost of all ancillary services? Is is possible to rank all services in this way? (CARD 12)

		1 Maintenance & repair - mechanical equipment.	2 Maintenance & repair - electrical equipment	3 Maintenance & repair - other	4 Transport	5 Storage	6 Cleaning	7 Printing	8 Waste disposal	9 Security	10 Other (please state)	11
YES												
NO												
% self sufficient												
TASMANIA												
Urban L'ton	Own firm 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Other firms 2											
Rest of N. & N.E. Tas.	1											
	2											
N.W. & W. Tas.	1											
	2											
S. Tas.	1											
	2											
Tas. unspecified	1											
	2											
MAINLAND												
Victoria	1											
	2											
N.S.W./A.C.T.	1											
	2											
W.A./S.A.	1											
	2											
Qld./N.T.	1											
	2											
Mainland unspecified	1											
	2											
OVERSEAS	1											
	2											
Unallocated total												
Most important service(s) by cost												

RK SS

ANC 1 ANC 2 ANC 3 ANC 4 ANC 5 ANC 6 ANC 7 ANC 8 ANC 9 ANC 10 ANC 11

572-593 594-615

ANC 1 ANC 2 ANC 3

L NT S M O

616-625 626-635 636-645

ANC 4 ANC 5 ANC 6

L NT S M O

646-655 656-665 666-675

ANC 7 ANC 8 ANC 9

L NT S M O

676-685 686-695 696-705

ANC 10 ANC 11

L NT S M O

706-715 716-725

ANC 1 ANC 2 ANC 3 ANC 4 ANC 5 ANC 6 ANC 7 ANC 8 ANC 9 ANC 10 ANC 11

NTB SB MB OB

726-733 734-741 742-749 750-757 758-765 766-773 774-781 782-789 790-797 798-805 806-813

- 12 -

18. Does the Launceston operation obtain any of the following professional/management services from outside establishments?

(a) IF YES,

(i) Indicate the degree (%) of the Launceston operation's self-sufficiency.

(ii) From which of the following areas do you obtain this service? (CARD 9)

(iii) What is the approximate % share of the total cost of this service from each of these areas? (Specify that which is provided by other establishments of this firm/group in each of the areas outside Launceston).

(b) Which of these are the most important in terms of the % share of the total cost of all professional/management services? Is it possible to rank all services in this way? (CARD 12)

		1	2	3	4	5	6	7	8	9	10	11	12
		Routine financial e.g. book keeping, payroll, cash flow	Non-routine financial e.g. annual audit, company tax.	Legal	Advertising	Management consultants	Market research	Research & development	Computer services	Technical specialists	Other (please state)		
YES													
NO													
% self sufficient													
TASMANIA													
Urban L'ton	Own firm 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Other firms 2												
Rest of N. & N.E. Tas.	1												
	2												
N.W. & W. Tas.	1												
	2												
S. Tas.	1												
	2												
Tas. unspecified	1												
	2												
MAINLAND													
Victoria	1												
	2												
N.S.W./A.C.T.	1												
	2												
W.A./S.A.	1												
	2												
Qld./N.T.	1												
	2												
Mainland unspecified	1												
	2												
OVERSEAS	1												
	2												
Unallocated total													
Most important service(s) by cost													

RK SS

MAN 1
MAN 2
MAN 3
MAN 4
MAN 5
MAN 6
MAN 7
MAN 8
MAN 9
MAN 10
MAN 11

814-837 838-861

MAN 1 MAN 2 MAN 3

L
NT
S
M
O

862-871 872-881 882-891

MAN 4 MAN 5 MAN 6

L
NT
S
M
O

892-901 902-911 912-921

MAN 7 MAN 8 MAN 9

L
NT
S
M
O

922-931 932-941 942-951

MAN 10 MAN 11 MAN 12

L
NT
S
M
O

952-961 962-971 972-981

MAN 1 MAN 2 MAN 3 MAN 4 MAN 5 MAN 6 MAN 7 MAN 8 MAN 9 MAN 10 MAN 11 MAN 12

NTB
SB
MB
OB

982-989 990-997 998-1005 1006-1013 1014-1021 1022-1029 1030-1037 1038-1045 1046-1053 1054-1061 1062-1069 1070-1077

A1 INPFAC ☐ 1078

A1 SERFAC ☐ 1079

19. To what extent are the following factors important in the choice of suppliers for

(i) physical inputs, and

(ii) ancillary and professional services?

Please indicate the most important factor in each case. (CARD 14)

	PHYSICAL INPUTS			SERVICES		
	Not important	Moderately important	Important	Not important	Moderately important	Important
1. Close access to supplier						
2. Cost of product/service						
3. Quality of product/service						
4. Reliability of delivery						
5. No alternative suppliers						
6. Personal knowledge of supplier						
7. Available from another branch of this firm						
8. Other (please state): _____						

INPFAC 1 - INPFAC 8 ☐☐☐☐☐☐☐☐ 1080 - 1087

SERFAC 1 - SERFAC 8 ☐☐☐☐☐☐☐☐ 1088 - 1095

20. (a) To what extent is close access to your customers important to the operations of the firm in Launceston for (i) ease of product delivery and (ii) ease of communication (particularly with respect to detailed specifications)?

	1. Not important	2. Moderately important	3. Important
Ease of product delivery			
Ease of communication			

AXSDEL ☐ 1096

AXSCOM ☐ 1097

A1 CONCUS ☐☐ 1098/99

A1 CONSUP ☐☐ 1100/01

A1 CONMT ☐☐ 1102/3

(b) How important are the following means of maintaining contacts with and seeking new: (i) customers, (ii) suppliers, and (iii) information sources on market trends and changes in technology? Please indicate the most important in each case. (CARD 15)

Code: 1. Not important 3. Important
2. Moderately important 9. N/A

Form of contact	Customers	Suppliers	Trends in market/technology
1. Trade journals/newsletters			
2. Conferences/conventions			
3. Local business association activities			
4. Refresher courses			
5. Visits from buying/selling agents			
6. Management tours			
7. Specific management visits to other firms			
8. Visits from management of other firms			
9. Government agencies			
10. Consult expert advisers			
11. No conscious effort made			
12. Advertising of products			
13. Other (please state): _____			

CONCUS 1- CONCUS 13 ☐☐☐☐☐☐☐☐☐☐☐☐☐ 1104- 1116

CONSUP 1- CONSUP 13 ☐☐☐☐☐☐☐☐☐☐☐☐☐ 1117- 1129

CONMT 1- CONMT 13 ☐☐☐☐☐☐☐☐☐☐☐☐☐ 1130- 1142

21. How do you evaluate Launceston in terms of access to each of the following: (CARD 16)

	1. Very poor	2. Poor	3. Adequate	4. Very good	5. Excellent
1. Customers					
2. Suppliers of physical inputs					
3. Suppliers of sub-contract manufacturing services					
4. Suppliers of ancillary services					
5. Suppliers of professional/ management services					

Comments: _____

_____

_____

_____

RLCUS ☐ 1143

RLINP ☐ 1144

RLSCON 2 ☐ 1145

RLANC ☐ 1146

RLMAN ☐ 1147

COM ☐ 1148

A3.2 Schecule B: Launceston only operations.

TASMANIAN COLLEGE OF ADVANCED EDUCATION

NEWNHAM

DEPARTMENT OF GEOGRAPHY

SURVEY OF THE MANUFACTURING INDUSTRY

IN URBAN LAUNCESTON 1980

CASE NO. _____

NAME OF FIRM _____

ADDRESS OF THESE PREMISES _____

NAME OF PERSON INTERVIEWED _____

POSITION IN FIRM _____

DATE OF INTERVIEW _____

CASENO [ ][ ][ ]
1 - 3

Are there any branches/subsidiaries of the firm/controlling company located outside Launceston?

1. [ ] YES → Use schedule A
2. [ ] NO → Use schedule B

FILENO [ ]
4

SCHEDULE B. FIRMS WHICH EXIST IN LAUNCESTON ONLY

The main purpose of this survey is to gather information on the nature and organisation of manufacturing in the city. Of particular interest is the way in which firms interact via such things as purchases and sales with other concerns, including those located elsewhere in Tasmania and on the mainland.

I would like to begin by discussing the nature of the entire activities of your firm, bearing in mind however that the primary focus is on manufacturing.

The survey is concerned with the WHOLE OF THE LAUNCESTON OPERATION, thus separate local plants are to be treated collectively.

1. (a) In general terms, what are the major activities of the firm in Launceston? (CARD 1)

   (b) Could you indicate the importance of each activity in terms of its % share of the total turnover of the firm for the last financial year? (CARD 1)

When considering the relative proportions in each category, it is important that any on-site activities undertaken subsequent to the actual manufacturing process such as building/ construction or installation/maintenance/repair for other concerns be separated from the manufacturing activity and included in the appropriate category.

	RANK	% SHARE OF TOTAL TURNOVER	
1.			Manufacture
2.			Sub-contract manufacture (CARD 1)
3.			Wholesale of other goods
4.			Retail of other goods
5.			Transport and Storage of goods for other firms or public
6.			Installation, Maintenance and Repair of equipment
7.			Building and Construction
8.			Management/professional services for other firms
9.			Other (please state): _____

MFR
SCMFR
WSALE
RETAIL
TRANS
IMR
BANDC
MANPROF
OTHERACT

5 - 22

2. Since my concern is manufacturing, I would like to look at those activities in more detail. In particular:

   (a) What are the major products (or groups of related products) manufactured by the firm? (CARD 2)

If response in terms of product group(s), specify any particular product which accounts for greater than 50% of total turnover.

   (b) Could you indicate the importance of each product (or product group) in terms of its % share of manuf. sales of the Launceston operation for the last financial year?

   (c) Which of the following categories best describes the nature of each of the major products (or product groups)? (CARD 2)

	PRODUCT/PRODUCT GROUP	% SHARE OF MANUF. SALES	PRODUCT CATEGORY
1.			
2.			
3.			
4.			
5.			

Code major product group as per Card 2

PRODGP
23 - 25

PRODSPEC
26

POSOP 1
27

Degree of Specialisation

1. Single product
2. Single product group, major product > 50%
3. Single product group, no product > 50%
4. More than one group, major product > 50%
5. More than one group, no product > 50%

Product Category

1. Predom. semi-manufactured goods
2. Predom. fabricated components
3. Predom. final product
4. Predom. sub-contract manufacture
5. Other (please state)

3. (a) Which of the following best describes the level at which the production process of this firm operates? (CARD 3)

1. ☐ Large scale assembly line/mass production (i.e. continuous standardised production
2. ☐ Batch production (i.e. limited production runs which vary according to nature of order(s)
3. ☐ Small scale unit production or 'jobbing' for specialised orders
4. ☐ Other, including any combination of the above (please specify): _____

OPMODE ☐ 28

(b) Is the firm engaged in research and development of:

(i) new products involving the manufacture of prototypes?
1. ☐ YES
2. ☐ NO

(ii) new production process technology?
1. ☐ YES
2. ☐ NO

PRODEV ☐ 29 TECHDEV ☐ 30

(c) On how many premises does the firm operate in Launceston?

1. ☐ No. of premises 1.
2. ☐ 2.
3. ☐ 3
4. ☐ More than 3

PREMNO ☐ 31

4. Which of the following best describes the organizational and ownership structure of the firm? (CARD 4)

1. ☐ Sole ownership
2. ☐ Partnership
3. ☐ Single registered company - privately owned
4. ☐ - publicly owned
5. ☐ A group of companies, this firm a subsidiary - privately owned
6. ☐ - publicly owned
7. ☐ A group of companies, L'ton management controls subsidiaries - privately owned
8. ☐ - publicly owned
9. ☐ Other (please state): _____

OWNSH ☐☐ 32 33

5. (a) Which of the following best describes the establishment of the original operations in Launceston? (CARD 5)

1. ☐ Originated and developed in the local environment
2. ☐ Relocated in Launceston from elsewhere
3. ☐ Established as a branch/subsidiary of a firm based elsewhere in Tasmania.
4. ☐ Established as a branch/subsidiary of a Mainland based firm
5. ☐ Established as a branch/subsidiary of an Overseas based firm
6. ☐ Other (please state): _____

ORIGIN ☐ 34

(b) Is the present organisational and ownership structure of the firm the result of any change that has occurred since establishment of the original operations?

1. ☐ YES IF YES, please specify form of takeover: _____
2. ☐ NO

NOWNSH ☐ 35 TAKFORM ☐☐ 36 37

(c) When did the firm commence operations in Launceston? If takeover/merger, indicate the date of establishment of existing operation (if known) and the takeover date.

DATE: (i) existing operation _____
(ii) takeover _____

1. ☐ pre 1945
2. ☐ 1945 - 59
3. ☐ 1960 - 69
4. ☐ 1970 - 75
5. ☐ 1976 - 80

ESTDATE ☐ 38 TAKDATE ☐ 39

6. (a) What was the total employment, including owners and managers, in the firm at the end of the last financial year (or at present if that is more convenient)?

For part-time workers, indicate the approximate total in terms of the number of equivalent full-time workers.

	No.
Full time	
Part-time (total)	
Part-time (number of equivalent full-time)	

	Total No.				
01		1 - 4	06		75 - 99
02		5 - 9	07		100 - 149
03		10 - 24	08		150 - 199
04		25 - 49	09		200 - 499
05		50 - 74	10		500 - 999
			11		> 1,000

EMP 131 132

(b) What was the number (or %) of the workforce in each of the following categories at the end of the last financial year (or at present if more convenient)? (CARD 6)

If a person has more than one function, or is a part-time employee, estimate the actual proportion of his/her time spent in each relevant category.

Category	No.	%
Management		
Sales		
Clerical		
Actual manufacturing process		
Transport		
Other (please state): e.g. stores, maintenance,etc		
_____		

1. Virtually no functional specialisation of work force
2. Owner/manager responsible for sales, clerical, plus process supervision
3. Management, clerical, process specialisation
4. Functional specialisation in most categories
5. Functional specialisation in all categories, including various management functions.

EMPSPEC 133

7. (a) In round figures, what was the total turnover of the firm for the last financial year? (CARD 7)

$ _____

	$		$
01	< 50,000	06	500,000 - 1M
02	50 - 75,000	07	1 - 2M
03	75 - 100,000	08	2 - 5M
04	100 - 250,000	09	5 - 10M
05	250 - 500,000	10	> 10M

TOTURN 134 135

(b) What is the current replacement value of the capital investment in your operations (buildings, machinery, etc.) in Launceston? (CARD 7)

$_____

	$		
01	< 50,000		
02	50 - 75,000	07	1 - 2M
03	75 - 100,000	08	2 - 5M
04	100 - 250,000	09	5 - 10M
05	250 - 500,000	10	10 - 25M
06	500,000 - 1M	11	> 25M

CAPINV 138 139

- 5 -

Now, could we focus on the sale of the products manufactured by the firm? The emphasis is on the areas in which sales are made. Firstly however,

8. (a) Which of the following best describes your usual sales procedure? (CARD 8)

(b) If more than one, indicate the importance of each procedure in terms of its % share of total sales by value.

	Rank	% Share of total sales		
1	N/A	N/A	Direct to other establishments of this firm/group for further manufacture	SBMFR
2	N/A	N/A	Direct to other establishments of this firm/group for distribution	SBDIST
3			Direct to one particular manufacturing firm	SMFR
4			Direct to a number of manufacturing firms	SMFRS
5			Direct to construction firms	SCONSTR
6			Direct to one particular wholesaler	SWHOL
7			Direct to a number of wholesalers	SWHOLS
8			Direct to retailers (i.e. firm does own wholesaling)	SRET
9			Direct to any other firm(s). State nature of firm: _____	SOTHFIR
10			Direct to government agencies	SGOV
11			Direct to public (i.e. firm does own wholesaling and retailing)	SPUB
12			Other (please state): _____	SOTHER

140 - 163

General code:

1. Sales to one specific firm
2. Sales to firms of one particular industrial group
3. Sales to a restricted combination of groups
4. No uniformity in sales procedure
5. Direct to other branches of firm

SPROC 164

9. Without considering the manufacturing services taken on as sub-contract work:

(a) In which of the following areas are your products sold? (CARD 9 and 9a)

(b) What is the approximate % share of total sales by value made to your immediate customer/agent in each of these areas?

(c) Are the sales to any of these areas restricted to one particular product or to a limited number of the firm's range of products? If so, please identify.

(d) Please indicate if the sales to any of these areas are dominated by one or very few specific buyers; and if so, whether they are a manufacturer, wholesaler, government department or other (please state).

AREA	% share total sales	Part of prod.range (if applic.)	Restricted range of buyers: Manuf.	W/S	Govt.	Other
TASMANIA						
Urban Launceston						
Rest of N. & N.E. Tas.						
N.W. & W. Tas.						
S. Tasmania						
Tasmania unspecified						
MAINLAND						
Victoria						
N.S.W./A.C.T.						
W.A./S.A.						
Qld./N.T.						
Mainland unspecified						
OVERSEAS						
UNALLOCATED TOTAL						

Part of product range

1. Single product of range
2. Limited number of range of products
3. Virtually all firm's products
4. N/A, i.e. all firm's products

Range of buyers

1. Restricted, manufacturer
2. Restricted, wholsaler
3. Restricted, Government agency
4. Restricted, other
5. N/A, i.e. no variation to usual sales procedure

	SALE	PRORA	BUYRA
L			
N			
NW			
S			
T			
M_1			
M_2			
M_3			
M_4			
M			
O			
UNA			

165-188 189-199 200-210

(e) (i) What is the % share of total sales to wholesalers in Launceston? _____%

(ii) do you have any knowledge of the general area in which your products are distributed by them? If yes, please provide details.

1		No knowledge	4		Nationally
2		N. & N.E. Tasmania	5		Internationally
3		State wide	6		Other (please state)

_____

LSALWHOL 241 242

WHOLDIS 243

10. For manufacturing services taken on as sub-contract work:

(a) what is the nature of the sub-contracting process(es)?

(b) could you indicate the importance of each process in terms of its % share (by value) of all sub-contracting for the last financial year?

	SUB-CONTRACT PROCESS (e.g. plating, heat treatment, specialist welding ...)	% share
1		
2		
3		
4		
5		
.		

Range of processes
1. Single process
2. Single group of related processes
3. Variety of processes spanning more than one product group
4. Other

SCONGP 1 244 - 246

PROCRA 1 247

11. (a) In which of the following areas are there concerns for whom your firm provides a sub-contracting service? (CARD 9 and 9a)

(b) What is the approximate % share of total sub-contracting revenue derived from each of these areas?

(c) Is the sub-contract work to any of these areas restricted to one particular process or a limited number of the firm's range of processes? If so, please identify.

(d) Please indicate if the sub-contract work to any of these areas is primarily for one or very few specific customers; and if so, whether they are an associated manufacturer (same product category as this firm), other manufacturer, or a non-manufacturing concern (please identify).

AREA	% share of total sub-contract revenue	Specific process(es) (if applicable)	Restricted range of customers		
			Ass. Manuf.	Other Manuf.	Non-Manuf.
TASMANIA					
Urban Launceston					
Rest of N. & N.E. Tas.					
N.W. & W. Tas.					
S. Tas.					
Tas. unspecified					
MAINLAND					
Victoria					
N.S.W./A.C.T.					
W.A./S.A.					
Qld./N.T.					
Mainland unspecified					
OVERSEAS					
Unallocated total					

Range of Processes
1. Single process of range
2. Limited number of range of processes
3. Virtually all firm's processes
4. N/A, i.e. all processes

SCON 1 SPPR 1 CUSRA

L
N
NW
S
T
M_1
M_2
M_3
M_4
M
O
UNA

248-271 272-282 283-293

Next I would like to focus on the inputs brought into the firm for the manufacturing process.

12. (a) What are the major inputs (or perhaps groups of related inputs) brought in for manufacturing? (CARD 2)

INPGP ☐☐☐ 324 - 326

Include process related inputs, i.e. essential to the operations yet not forming part of the final product such as energy, packaging, sand ....; but do not include goods supplied by other concerns for whom you were providing a sub-contracting function.

(b) Could you indicate the importance of each input (or input group) in terms of its % share of the total value of all inputs for the last financial year?

(c) Which of the following categories best describes the nature of each of the major product related inputs used? (CARD 10)

INPDIV ☐ 327

	INPUT/INPUT GROUP	% SHARE	INPUT CATEGORY
1.			
2.			
3.			
4.			
5.			
Energy			
Packaging material			
Other process related inputs			

POSOP ☐ 328

Product groups
As per Card 2

INPEN ☐☐☐
INPACK ☐☐☐
INPROC ☐☐☐ 329 - 334

Input Category

1. Predom. un-processed raw material
2. Predom. semi-manufactured goods
3. Predom. fabricated components

Degree of diversity of product related inputs

1. Dominated by one input
2. Dominated by group of related inputs
3. Wide range of inputs

(d) What % share of total manufacturing costs (i.e. all costs in producing and selling) do these inputs represent? _____%

INPCOST ☐☐ 335 336

13. *For all input requirements (including process related inputs) but not goods supplied by other concerns for whom you provide a sub-contracting function:*

(a) From which of the following areas do you purchase your inputs? (CARD 9)

(b) What is the approximate % share of total inputs by value obtained from each of these areas?

(c) Are the purchases from any of these areas restricted to one particular input or a limited number of the firm's range of inputs? If so, please identify, particularly in relation to energy, packaging and other process related inputs.

(d) Please indicate if the purchases from any of these areas are made because it is: (CARD 11)

1. the only available source
2. one of a number of satisfactory sources
3. the cheapest source
4. the most reliable source
5. better quality material
6. a group purchase
7. no particular reason
8. other (please state):

AREA	% share of total inputs	Part of input range if applicable	Reason for purchase in area
TASMANIA			
Urban Launceston			
Rest of N. & N.E. Tas.			
N.W. & W. Tas.			
S. Tas.			
Tas. unspecified			
MAINLAND			
Victoria			
N.S.W./A.C.T.			
W.A./S.A.			
Qld./N.T.			
Mainland unspecified			
OVERSEAS			
Unallocated total			

Part of input range

1. Single input
2. Limited number of range of inputs
3. Process related input only
4. Packaging material
5. Virtually all inputs
6. N/A, i.e. all inputs

	INP	INPRA	REPUR
L	☐☐	☐☐☐	☐
N	☐☐	☐☐☐	☐
NW	☐☐	☐☐☐	☐
S	☐☐	☐☐☐	☐
T	☐☐	☐☐☐	☐
M_1	☐☐	☐☐☐	☐
M_2	☐☐	☐☐☐	☐
M_3	☐☐	☐☐☐	☐
M_4	☐☐	☐☐☐	☐
M	☐☐	☐☐☐	☐
O	☐☐	☐☐☐	☐
UNA	☐☐	☐☐☐	☐
	337-360	361 - 393	394-404

(e) (i) what is the % share of total purchases from wholesalers in Launceston? _____ %

(ii) do you have any knowledge of the initial source of the inputs by these wholesalers? If so, please provide details.

1.	No knowledge	4.	Mainland
2.	N. & N.E. Tas.	5.	Overseas
3.	Elsewhere in Tas.	6.	Other (please state) _____

LSUPWHOL 465 466

INITSUP 467

14. (a) When did the firm last purchase any major item of machinery or equipment? Date: _____

1.	Pre 1960	3.	1970-75
2.	1960-69	4.	1976-80

DMACHPUR 468

(b) Nature of machinery or equipment: _____

MACHTYPE 469 470

(c) From which of the following areas was it (i) purchased and (ii) manufactured? (CARD 9)

TASMANIA		MAINLAND	
01	Urban Launceston	06	Victoria
02	Rest of N. & N.E. Tas.	07	N.S.W./A.C.T.
03	N.W. & W. Tas.	08	W.A./S.A.
04	S. Tas.	09	Qld./N.T.
05	Tas. unspecified	10	Mainland unspecified
		11	OVERSEAS

AMACHPUR 471 472

AMACHMFR 473 474

(d) What was its approximate value? $ _____

		$			$
01		< 5,000	06		100-250,000
02		5-10,000	07		250-500,000
03		10-25,000	08		500-750,000
04		25-50,000	09		750 - 1M
05		50-100,000	10		> 1Million

MACHVAL 475 476

The survey is also concerned with the extent to which services are provided for you by firms and offices in Launceston and elsewhere. I would like to consider first any manufacturing processes which you may sub-contract out, before looking at various ancillary services such as maintenance and repair, and management/professional services such as legal and financial advice.

15. (a) Do you sub-contract out for any manufacturing process? i.e. goods leave your firm for further processing by other firms and then return.

1 ☐ YES
2 ☐ NO

SCON 2 ☐ 479

IF YES,

(b) What specific process(es) do you sub-contract out?

(c) Could you indicate the importance of each process in terms of its % share (by value) of all subcontracting, for the last financial year?

	SUB-CONTRACT PROCESS (e.g. plating, heat treatment, specialist welding ...)	% share
1.		
2.		
3.		
4.		
5.		

SCONGP 2 ☐☐☐ 480 - 482

Range of Processes
1. Single process
2. Single group of related processes
3. Variety of processes spanning more than one product group
4. Other

PROCRA 2 ☐ 483

SCONCOST ☐☐ 484 485

(d) What % share of total manufacturing costs (i.e. all costs in producing and selling) do these sub-contract out processes represent? _____%

16. (a) In which of the following areas are there firms to whom you sub-contract out? (CARD 9)

(b) What is the approximate % share of total sub-contracting costs paid out in each of these areas?

(c) Is the sub-contract work carried out in any of these areas restricted to one particular process or a limited number of processes required by the firm? If so, please identify.

(d) For each of these areas, is the sub-contract work undertaken for you on a regular (routine) basis, or irregularly such as situations related to special 'once off' jobs or as 'over-flows' when your firm is at capacity?

AREA	% share of subcontracting costs	Specific process(es) if applic.	Regularity
TASMANIA Urban Launceston			
Rest of N. & N.E. Tas.			
N.W. & W. Tas.			
S. Tas.			
Tas. unspecified			
MAINLAND Victoria			
N.S.W./A.C.T.			
W.A./S.A.			
Qld./N.T.			
Mainland unspecified			
OVERSEAS			
Unallocated total			

Range of Processes
1. Single process
2. Limited number of range of processes required
3. Virtually all of the processes required
4. N/A i.e. all processes required

Regularity
1. Regular
2. Irregular - special jobs
3. Irregular - overflow

	SCON 2	SPPR 2	REG
L			
N			
NW			
S			
T			
M_1			
M_2			
M_3			
M_4			
M			
O			
UNA		510-520	521-531
	486-509		

- 10 -

17. Does the firm contract out to other establishments for any of the following ancillary services, i.e. related to the manufacturing process?

(a) IF YES,

(i) Indicate the degree (%) of the firm's self-sufficiency.

(ii) From which of the following areas do you obtain this service? (CARD 9)

(iii) What is the approximate % share of the total cost of this service from each of these areas?

(b) Which of these are the most important in terms of the % share of the total cost of all ancillary services? Is it possible to rank all services in this way? (CARD 12)

	1 Maintenance & repair - mechanical equipment.	2 Maintenance & repair - electrical equipment	3 Maintenance & repair - other	4 Transport	5 Storage	6 Cleaning	7 Printing	8 Waste disposal	9 Security	10 Other (please state):	11
YES											
NO											
% self sufficient											
TASMANIA											
Urban Launceston											
Rest of N. & N.E. Tas.											
N.W. & W. Tas.											
S. Tas.											
Tas. unspecified											
MAINLAND											
Victoria											
N.S.W./A.C.T.											
W.A./S.A.											
Qld./N.T.											
Mainland unspecified											
OVERSEAS											
Unallocated total											
Most important service(s) by cost											

RK SS

ANC 1
ANC 2
ANC 3
ANC 4
ANC 5
ANC 6
ANC 7
ANC 8
ANC 9
ANC 10
ANC 11

572-593 594-615

ANC 1 ANC 2 ANC 3

L NT S M O

616-625 626-635 636-645

ANC 4 ANC 5 ANC 6

L NT S M O

646-655 656-665 666-675

ANC 7 ANC 8 ANC 9

L NT S M O

676-685 686-695 696-705

ANC 10 ANC 11

L NT S M O

706-715 716-725

18. Does the firm obtain any of the following professional/management services from outside establishments?

(a) IF YES,

(i) Indicate the degree (%) of the firm's self-sufficiency.

(ii) From which of the following areas do you obtain this service? (CARD 9)

(iii) What is the approximate % share of the total cost of this service from each of these areas?

(b) Which of these are the most important in terms of the % share of the total cost of all professional/management services? Is it possible to rank all services in this way? (CARD 12)

	1 Routine financial e.g. book keeping, payroll, cash flow	2 Non-routine financial e.g. annual audit, company tax	3 Legal	4 Advertising	5 Management consultants	6 Market research	7 Research & development	8 Computer services	9 Technical specialists	10 Otner (please state)	11	12
YES												
NO												
% self sufficient												
TASMANIA Urban Launceston												
Rest of N. & N.E. Tas.												
N.W. & W. Tas.												
S. Tas.												
Tas. unspecified												
MAINLAND Victoria												
N.S.W./A.C.T.												
W.A./S.A.												
Qld./N.T.												
Mainland unspecified												
OVERSEAS												
Unallocated total												
Most important service(s) by cost												

RK SS

MAN 1
MAN 2
MAN 3
MAN 4
MAN 5
MAN 6
MAN 7
MAN 8
MAN 9
MAN 10
MAN 11

814-837 838-861

MAN 1 MAN 2 MAN 3

L NT S M O

862-871 872-881 882-891

MAN 4 MAN 5 MAN 6

L NT S M O

892-901 902-911 912-921

MAN 7 MAN 8 MAN 9

L NT S M O

922-931 932-941 942-951

MAN 10 MAN 11 MAN 12

L NT S M O

952-961 962-971 972-981

I would like to conclude by discussing the way in which the firm chooses its suppliers for the various inputs that we have discussed, and your attitude on the desirability of being in close proximity to suppliers and customers.

A1 INPFAC ☐ 1078

A1 SERFAC ☐ 1079

19. (a) To what extent are the following factors important in the choice of suppliers for

(i) physical inputs, and

(ii) ancillary and professional services?

Please indicate the most important factor in each case. (CARD 14)

	PHYSICAL INPUTS			SERVICES		
	Not important	Moderately important	Important	Not important	Moderately important	Important
1. Close access to supplier						
2. Cost of product/service						
3. Quality of product/service						
4. Reliability of delivery						
5. No alternative suppliers						
6. Personal knowledge of supplier						
_____						
8. Other (please state):						

INPFAC 1 - INPFAC 8 ☐☐☐☐☐☐☐☐ 1080 - 1087

SERFAC 1 - SERFAC 8 ☐☐☐☐☐☐☐☐ 1088 - 1095

20. (a) To what extent is close access to your customers important to the operations of the firm in Launceston for (i) ease of product delivery and (ii) ease of communication (particularly with respect to detailed specifications)?

	1. Not important	2. Moderately important	3. Important
Ease of product delivery			
Ease of communication			

AXSDEL ☐ 1096

AXSCOM ☐ 1097

A1 CONCUS ☐☐ 1098/99

A1 CONSUP ☐☐ 1100/01

A1 CONMT ☐☐ 1102/3

(b) How important are the following means of maintaining contacts with and seeking new: (i) customers, (ii) suppliers, and (iii) information sources on market trends and changes in technology? Please indicate the most important in each case. (CARD 15)

Code: 1. Not important 3. Important
2. Moderately important 9. N/A

Form of contact	Customers	Suppliers	Trends in market/technology
1. Trade journals/newsletters			
2. Conferences/conventions			
3. Local business association activities			
4. Refresher courses			
5. Visits from buying/selling agents			
6. Management tours			
7. Specific management visits to other firms			
8. Visits from management of other firms			
9. Government agencies			
10. Consult expert advisers			
11. No conscious effort made			
12. Advertising of products			
13. Other (please state): _____			

CONCUS 1- CONCUS 13 ☐☐☐☐☐☐☐☐☐☐☐☐☐ 1104- 1116

CONSUP 1- CONSUP 13 ☐☐☐☐☐☐☐☐☐☐☐☐☐ 1117- 1129

CONMT 1- CONMT 13 ☐☐☐☐☐☐☐☐☐☐☐☐☐ 1130- 1142

21. How do you evaluate Launceston as a location in terms of access to each of the following:
(CARD 16)

	1. Very poor	2. Poor	3. Adequate	4. Very good	5. Excellent
1. Customers					
2. Suppliers of physical inputs					
3. Suppliers of sub-contract manufacturing services					
4. Suppliers of ancillary services					
5. Suppliers of professional/ management services					

Comments: _____

RLCUS [ ] 1143

RLINP [ ] 1144

RLSCON 2 [ ] 1145

RLANC [ ] 1146

RLMAN [ ] 1147

CCN [ ] 1148

A3.3 Information cards used during interviews.

This set of cards applied to Schedule A. References to branches/ subsidiaries were deleted for Schedule B.

Card 2 was on hand in the event that a respondent was reluctant to divulge product specifics.

Card 11 was used as a prompt only

Card 13 detailed components of cost structure which were deleted after the pilot survey.

CARD 1

TOTAL TURNOVER: total revenue from all sales, the value of transfers of goods between the establishments of the one firm, the provision of services including sub-contract work, plus any other form of income such as repair revenue, commission, etc.

SUB-CONTRACT MANUFACTURE: includes work in the form of manufacturing services or facilities provided by you where the customer supplies the unit input; e.g. cutting keyways, plating, heat treatment .....

CATEGORIES OF ACTIVITY:

1. Manufacture
2. Sub-contract manufacture
3. Wholesale of other goods
4. Retail of other goods
5. Transport and storage of goods for other firms or public
6. Installation, maintenance and repair of equipment
7. Building and construction
8. Management/professional services for other firms
9. Other

CARD 2

PRODUCT GROUPS:

01	Food, drink, tobacco	(1. Food products; 2. Beverages and malt; 3. Tobacco products)
02	Textiles	(1. Textile fibres, yarns and woven fabrics and household textiles; 2. Other textiles, e.g floor covering, canvas)
03	Clothing and footwear	(1. Knitting mills; 2. Clothing; 3. Footwear)
04	Wood, wood products and furniture	(1. Sawn and dressed timber; 2. Wood products; 3. Furniture; 4. Other)
05	Paper, paper products, printing and publishing	(1. Pulp, paper, paper board; 2. Paper products; 3. Printing and publishing)
06	Chemicals, petroleum, and coal products	(1. Chemical products; 2. Petroleum and coal products)
07	Glass, clay and other non-metallic mineral products	(1. Glass and glass products; 2. Clay products; 3. Cement and concrete products; 4. Other non-metallic mineral products, e.g. plaster and stone products)
08	Basic metal products	(1. Basic iron and steel; 2. Non-ferrous metal basic products)
09	Fabricated metal products	(1. Structural metal products; 2. Sheet metal products; 3. Other, e.g. cutlery, springs, wire, plating, valves, venetion blinds)
10	Transport equipment	(1. Motor vehicles and parts; 2. Other transport equipment)
11	Other industrial equipment	(1. Photographic, professional and scientific equipment; 2. Other machinery and equipment, e.g. agricultural, construction, wood and metal working etc. equipment)
12	Household appliances and electrical equipment	
13	Leather goods	
14	Rubber products	16. Other manufactured products
15	Plastic products	17. Any combination of the above

CARD 2 cont.

CATEGORY OF PRODUCT

1. Semi-manufactured goods to be further transformed by other manufacturers.
2. Fabricated components to be assembled by other manufacturers.
3. The final product ready for wholesale/retail distribution.
4. Those that have involved a sub-contracted manufacturing service on goods from other firms.
5. Other (please state)

CARD 3

MODE OF OPERATIONS:

1. Large scale assembly line/mass production, i.e. continuous standardised production.
2. Batch production, i.e. limited production runs which vary according to nature of order(s).
3. Small scale unit production or 'jobbing' for specialised orders.
4. Other, including any combination of the above. (Please specify).

CARD 4

ORGANISATIONAL & OWNERSHIP STRUCTURE:

1. Sole ownership
2. Partnership
3. Single registered company - privately owned
4. - publicly owned
5. A group of companies, this firm a subsidiary - privately owned
6. - publicly owned
7. A group of companies, Launceston management controls subsidiaries,
   - privately owned
8. - publicly owned
9. Other (please state)

CARD 5

MODE OF ORIGIN:

1. Originated and developed in the local environment
2. Relocated in Launceston from elsewhere
3. Established in Launceston as a branch/subsidiary of a firm based elsewhere in Tasmania.
4. Established in Launceston as a branch/subsidiary of a Mainland based firm.
5. Established in Launceston as a branch/subsidiary of an Overseas based firm.
6. Other (please state):

CARD 5a (With CARD 9a)

AREAS:

TASMANIA	Urban Launceston	MAINLAND	Victoria
	Rest of N. & N.E. Tas.		N.S.W./A.C.T.
	N.W. & W. Tas.		W.A./S.A.
	S. Tas.		Qld./N.T.

OVERSEAS

ANCILLARY SERVICES: Services related to the actual manufacturing process such as maintenance and repair, transport, cleaning, storage, printing and waste disposal.

PROFESSIONAL SERVICES: Services of a professional/management nature required for the overall operation of the firm such as financial, legal, advertising, market research and other specialist consultants.

CARD 6

WORKFORCE CATEGORIES:

1. Management
2. Sales
3. Clerical
4. Actual manufacturing process
5. Transport
6. Other (please state)

CARD 7

CATEGORIES OF TOTAL TURNOVER:

		$			$
1.	_____	<50,000	6.	_____	500,000 - 1M
2.	_____	50-75,000	7.	_____	1 - 2M
3.	_____	75-100,000	8.	_____	2 - 5M
4.	_____	100-250,000	9.	_____	5 - 10M
5.	_____	250-500,000	10.	_____	>10M
	_____			_____	

CATEGORIES OF CAPITAL INVESTMENT:

		$			$
1.	_____	<50,000	7.	_____	1 - 2M
2.	_____	50-75,000	8.	_____	2 - 5M
3.	_____	75-100,000	9.	_____	5 - 10M
4.	_____	100-250,000	10.	_____	10 - 25M
5.	_____	250-500,000	11.	_____	>25M
6.	_____	500,000 - 1M		_____	
	_____				

CARD 8

SALES PROCEDURE:

1. Direct to other establishments of this firm/group for further manufacture.
2. Direct to other establishments of this firm/group for distribution.
3. Direct to one particular manufacturing firm.
4. Direct to a number of manufacturing firms.
5. Direct to construction firms.
6. Direct to one particular wholesaler.
7. Direct to a number of wholesalers
8. Direct to retailers (i.e. firm does own wholesaling)
9. Direct to any other firm(s). (State nature of firm).
10. Direct to government agencies.
11. Direct to public (i.e. firm does own wholesaling and retailing)
12. Other (please state).

CARD 9 (With CARD 9a)

AREAS:

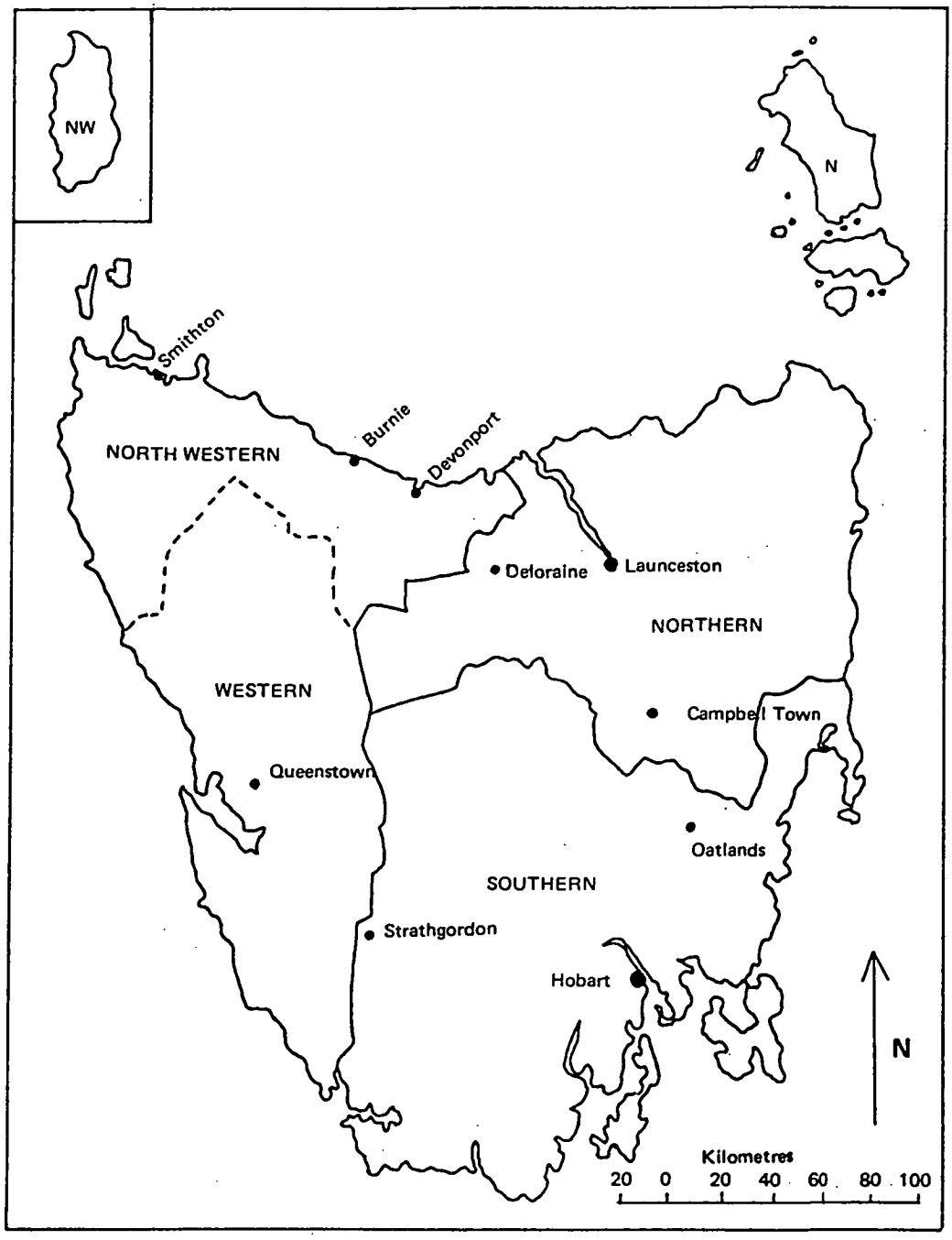
TASMANIA	Urban Launceston	MAINLAND	Victoria
	Rest of N. & N.E. Tas.		N.S.W./A.C.T.
	N.W. & W. Tas.		W.A./S.A.
	S. Tas.		Qld./N.T.
		OVERSEAS	

CARD 10

CATEGORY OF INPUT:

1. Unprocessed raw material
2. Semi-manufactured goods to be further transformed by this firm
3. Fabricated components to be assembled by this firm

CARD 9a



TASMANIA: REGIONAL DIVISION AND LOCAL GOVERNMENT AREAS

SOUTHERN:

Bothwell
Brighton
Bruny
Clarence
Esperance
Glamorgan
Glenorchy
Green Ponds
Hamilton
Hobart
Huon
Kingborough
New Norfolk
Oatlands
Port Cygnet
Richmond
Sorell
Spring Bay
Tasman

NORTHERN:

Campbell Town
Beaconsfield
Deloraine
Evandale
Fingal
Flinders
George Town
Launceston
Lilydale
Longford
Portland
Ringarooma
Ross
St. Leonards
Scottsdale
Westbury

NORTHWESTERN:

Burnie
Circular Head
Devonport
Kentish
King Island
Latrobe
Penguin
Ulverstone
Wynyard

WESTERN:

Gormanston
Queenstown
Strahan
Waratah
Zeehan

CARD 11

REASON FOR PURCHASE IN AREA

1. The only available source
2. One of a number of satisfactory sources
3. The cheapest source
4. The most reliable source
5. Better quality material
6. A group purchase
7. No particular reason
8. Other (please state)

CARD 12

ANCILLARY SERVICES

1. Maintenance and repair
   - mechanical equipment
2. Maintenance and repair
   - electrical equipment
3. Maintenance and repair
   - other
4. Transport
5. Storage
6. Cleaning
7. Printing
8. Waste disposal
9. Security
10. Other

PROFESSIONAL SERVICES

1. Routine financial - e.g. book-keeping, payroll, cash flow
2. Non-routine financial - e.g. annual audit, company tax
3. Legal
4. Advertising
5. Management consultants
6. Market research
7. Research and development
8. Computer services
9. Technical specialists
10. Other

CARD 13

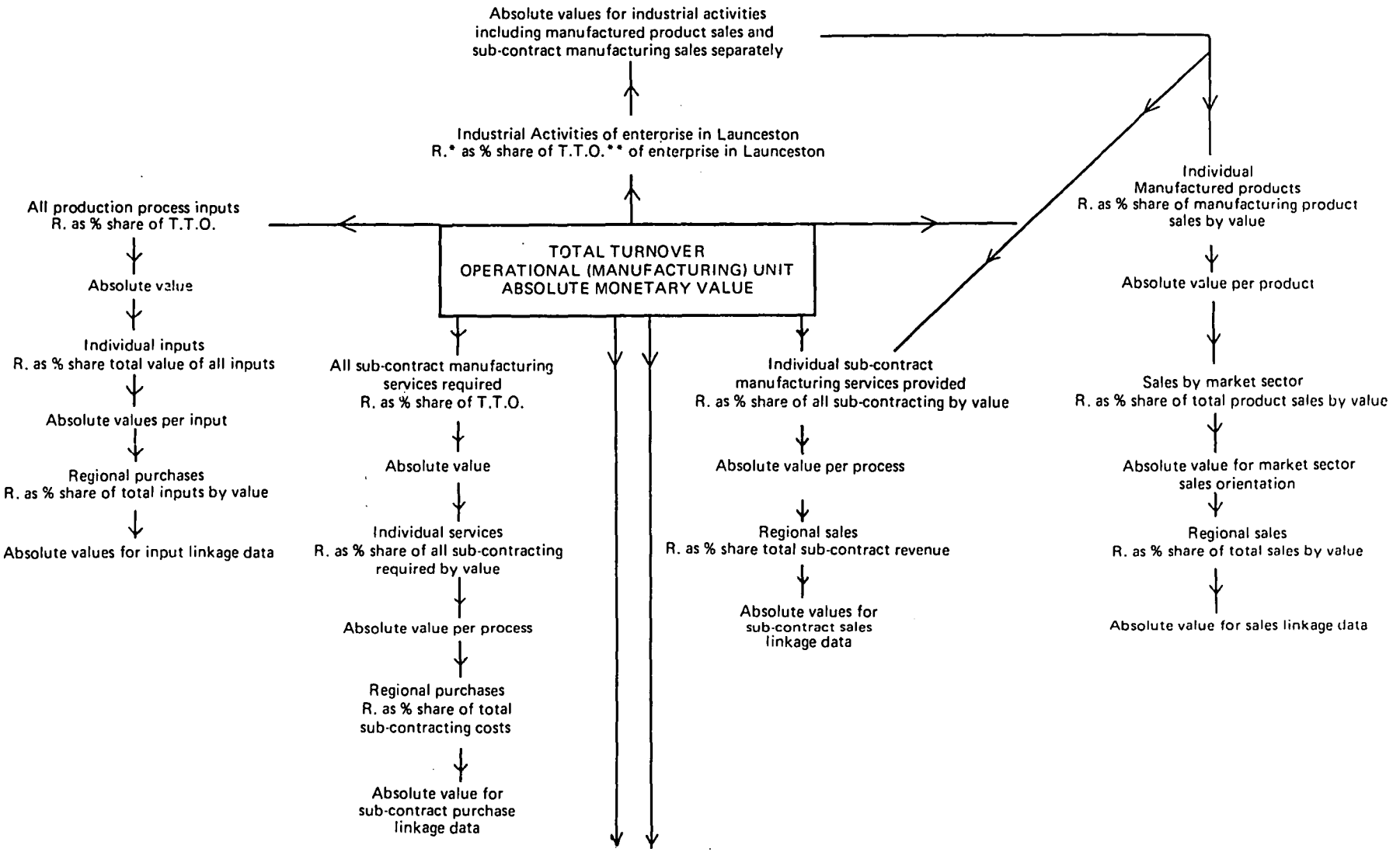
Referred to structure of production costs. Deleted after pilot survey.

CARD 14	PHYSICAL INPUTS			SERVICES		
	Not important	Moderately important	Important	Not important	Moderately important	Important
1. Close access to supplier						
2. Cost of product/service						
3. Quality of product/service						
4. Reliability of delivery						
5. No alternative suppliers						
6. Personal knowledge of supplier						
7. Available from another branch of this firm						
8. Other (please state): _____						

CARD 15	Customers	Suppliers	Trends in market/technology
1. Trade journals/newsletters			
2. Conferences/conventions			
3. Local business association activities			
4. Refresher courses			
5. Visits from buying/selling agents			
6. Management tours			
7. Specific management visits to other firms			
8. Visits from management of other firms			
9. Government agencies			
10. Consult expert advisers			
11. No conscious effort made			
12. Advertising of products			
13. Other (please state): _____			

CARD 16	1. Very poor	2. Poor	3. Adequate	4. Very good	5. Excellent
1. Customers					
2. Suppliers of physical inputs					
3. Suppliers of sub-contract manufacturing services					
4. Suppliers of ancillary services					
5. Suppliers of professional/ management services					

A3.4: Structure of the interview schedule intended to provide a data base in absolute monetary terms.



Continued over page

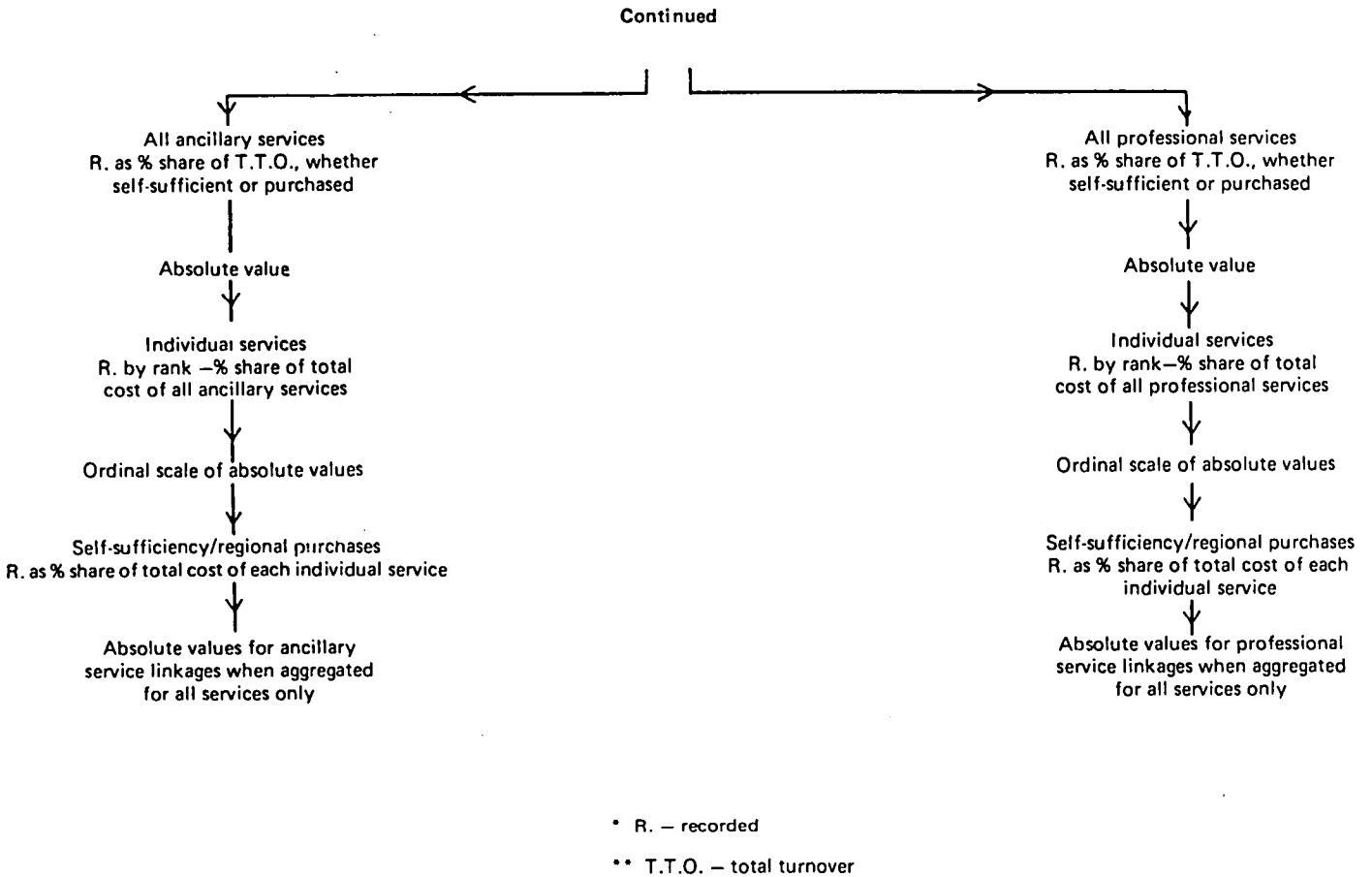


Figure A3.1: Relationships between the absolute value of turnover and the elements of firm character and linkage data couched in terms of relative proportions of total turnover.

A3.5: Preliminary contact with Launceston manufacturers.

TASMANIAN COLLEGE OF ADVANCED EDUCATION
NEWNHAM CAMPUS

SCHOOL OF GENERAL STUDIES

P.O. BOX 1214, LAUNCESTON.
TASMANIA. 7250.
TELEPHONE (003) 26 1244
TELEX: 58675 'COLADED'
PLUMER STREET,
NEWNHAM. 7250.

1st September, 1980

The Manager,

Dear Sir/Madam,

We are writing to inform you of a survey to be undertaken on the Launceston manufacturing economy and to seek your co-operation in providing a little time for a personal interview at some later date. The research programme is being developed as a local on-going concern emanating from the Tasmanian College of Advanced Education, however the initial survey component will form the basis of a report to be submitted for a higher degree from the University of Tasmania. The College is actively supporting the project by providing a period of study leave and has done so because it recognises a responsibility in Northern Tasmania to encourage local research in order that staff may provide informed advice on community affairs.

The primary concern of the survey is to gather information on the nature and organisation of manufacturing in the city. Of particular interest is the way in which firms interact via such things as purchases and sales with other concerns, including those located elsewhere in Tasmania and on the mainland. This will allow an assessment of the impact of firms on one another generally, but especially the varying levels of support for local manufacturing. The information will be of benefit to all groups interested in the well-being of the Launceston economy.

The aims of the survey are such that it is preferable for the local management of branches of large firms to respond, and the questionnaire has been designed with this factor in mind. The information required relates to the local operations only and is of such a nature that reference to records and accounts is unlikely to be required. Of course, all information will remain absolutely confidential. The data will be aggregated into tables to prevent the possibility of any individual firm being identified.

You will be contacted in the near future to arrange a suitable time and we look forward to your co-operation.

Yours sincerely,

B. H. GORDON, F.C.A.
SECRETARY
TELEPHONE: 31 7979

THE LAUNCESTON CHAMBER OF COMMERCE

MEMBER OF THE FEDERATION OF COMMONWEALTH CHAMBERS OF COMMERCE. P.O. BOX 549
57 GEORGE STREET,
LAUNCESTON, TASMANIA. 7250

11th September, 1980

TO WHOM IT MAY CONCERN

Mr. Peter Hanson, Senior Lecturer - Geography, Tasmanian College of Advanced Education, has discussed with me the survey he intends to undertake on the Launceston manufacturing economy. The primary concern of the survey is to gather information on the nature and organization of manufacturing in the city.

Mr. Hanson will be personally calling on you and if you could be of any assistance to him it would be appreciated.

Yours faithfully,

Brian H. Gordon,
Secretary.

A3.6 Additional and reformulated coding.

This material is sequenced as per Schedule A and contains the entire subset of material relevant to Schedule B.

Question 1

Variables modified to three column integer format and coded as actual percentage. This was common to all subsequent questions requiring percentage responses, *viz.* Questions 7(b), 8(b), 9(b,e), 11(b), 12(d), 13(b,e), 15(d), 16(b), 17(a), 18(a).

Question 2

Product classification:

Sub-division		Group
010	Food, drink, tobacco	(1. Food products; 2. Beverages and malt; 3. Tobacco products E.g. 010 - Undifferentiated Food etc. sub-division; 011 - Food products only)
020	Textiles	(1. Textile fibres, yarns and woven fabrics and household textiles; 2. Other textiles, e.g. floor covering, canvas)
030	Clothing and footwear	(1. Knitting mills; 2. Clothing; 3. Footwear)
040	Wood, wood products and furniture	(1. Sawn and dressed timber; 2. Wood products; 3. Furniture; 4. other; 7. Timber and wood products)

Question 2 cont.

050	Paper, paper products, printing and publishing	(1. Pulp, paper, paper board; 2. Paper products; 3. printing and publishing)
060	Chemicals, petroleum, coal products	(1. Chemical products; 2. Petroleum and coal products)
070	Glass, clay and other non-metallic mineral products	(1. Glass and glass products; 2. Clay products; 3. Cement and concrete products; 4. Other non-metallic mineral products, e.g. plaster and stone products)
080	Basic metal products	(1. Basic iron and steel; 2. Non-ferrous metal basic products)
090	Fabricated metal products	(1. Structural metal products; 2. Sheet metal products; 3. Other, e.g. cutlery, springs, wire, plating, valves, venetian blinds)
100	Transport equipment	(1. Motor vehicles and parts; 2. Other transport equipment)
110	Other industrial machinery and equipment	(1. Photographic, professional and scientific equipment; 2. Other machinery and equipment, e.g. agricultural, construction, wood and metal working etc. equipment)
120	Household appliances and electrical equipment	
130	Leather goods	
140	Rubber products	
150	Plastic products	
160	Other manufactured products	

Question 2 cont.

Degree of specialisation:

1. Single product.
2. Single product group, major product >50% share of sales.
3. Single product group, no product >50% share of sales.
4. Single product sub-division, major product >50% share of sales.
5. Single product sub-division, no product >50% share of sales.
6. More than one sub-division, major product >50% share of sales.

Product category: (Predominantly defined as ≥60% share of total value of sales).

1. Predominantly semi-manufactured goods.
2. Predominantly fabricated components to manufacturers.
3. Predominantly fabricated components and service products to non-manufacturers.
4. Predominantly final product.
5. Predominantly final product and components/service products to non-manufacturers.
6. Predominantly sub-contract manufacture.
7. Other combinations.

Question 3(a)

Level of production process:

1. Large scale assembly line/mass production (i.e. continuous standardised production).
2. Batch production (i.e. limited production runs which vary according to nature of orders).
3. Small scale unit production or 'jobbing' for specialised orders.
4. Small scale continuous production.
5. Combination mass production and batch.
6. Combination batch and jobbing.
7. Other.

Question 5(b)

Change in ownership structure:

01 Outright purchase

02 Change in partners

03 Partnership to sole ownership/single family business

04 Sole ownership to partnership

05 Transfer within family

06 Original operation registered as a company

07 Ownership increased by others buying into firm

08 Local operation increased in size by takeover of other local/Tasmanian operations

09 Merger of local or Tasmanian based operations, head office Launceston

10 Local operation in joint venture with Mainland based company, retains separate identity

11 Expansion of local operation, head office relocated to Mainland

12 Local operation merged with Mainland operation

13 Mainland/Overseas based involved in multinational merger

14 Local operation taken over by Tasmanian based group, head office outside Launceston

15 Local/Tasmanian operation taken over by Mainland group

16 Mainland based taken over by Mainland/Overseas based groups

17 Overseas based taken over by larger group

18 Mainland based increased existing Launceston operation by takeover of a local operation

19 Other

Question 5(d)

Category of controlling office:

0 Response ultimate head office, interviewer doubtful

1 Ultimate head office

2 Australian head office

3 Australian divisional head office

4 Victorian/Tasmanian regional office, total operation or divisional

5 Tasmanian regional office, total operation or divisional

6 Northern Tasmanian regional office, total operation or divisional

Location of other branches/subsidiaries:

Complete details of mainland Australian branches/subsidiaries of the entire company could not be obtained reliably, therefore not incorporated.

Number and location of Tasmanian branches/subsidiaries recorded and functionally discriminated between manufacturing and distributional establishments.

Question 5(e)

Location of office responsible for particular decisions:

00 No decision made

01-11 Standard regional breakdown adopted for study (as per table, page 4, schedule A). Thus 01 represented 'This office fully autonomous'.

66 Shared responsibility with controlling office

77 Local recommendation submitted for approval.

Category of office responsible for particular decisions:

As for 5(d) above, plus

7 This office.

Location(s) of operations over which this office has control for particular decisions:

0 No decision necessary

1 North Eastern Tasmania

2 Northern Tasmania

3 Tasmania

4 South Eastern Australia

5 Australia

6 Decision taken at a higher level than this office

7 Branch(es) autonomous for this decision.

Question 6(b)

Functional specialisation in labour force:

1. No functional specialisation in labour force

2. Owner/manager responsible for sales, clerical plus process supervision

3. Management, clerical, process specialisation

4. Management, sales, process specialisation

5. Functional specialisation in most categories

6. Functional specialisation in all categories, including various management functions.

Question 8

Sales procedure was also discriminated in terms of:

1. For further production/construction/distribution

2. For buying firms' own use as the final consumer

3. Combination of 1 and 2.

General Code(SPROC):

1. Sales to one specific firm

2. Sales to firms of one particular industrial sector

3. Sales to a restricted combination of sectors

4. No uniformity in sales procedure (>3 different sectors)

5. Direct to other establishments of the firm

6. Direct to public.

Question 9(d)

Range of buyers:

1. Restricted, manufacturer
2. Restricted, wholesaler
3. Restricted, government agency
4. Branch/subsidiary of own firm
5. Restricted other
6. No substantial variation to usual sales procedure
7. Restricted, retailer

Question 10(a)

Nature of sub-contracting in process(es):

100 METAL INDUSTRY BASED:

10	1. Cutting;	2. Guillotining;	3. Press brake work.
11	1. Forming;	2. Rolling;	3. Bending.
12	1. Drilling;	2. Horizontal Boring;	3. Punching.
13	1. Machining;	2. Precision Machining	3. Large scale grinding
14	1. Steel welding;	2. Aluminium welding	3. Stainless steel/ sheetmetal welding
15	1. Specialised casting;	2. Forging	
161	Heat treatment of metals		
171	Plating		
181	Shot blasting		

e.g. 100 - Variety of metal industry based processes; 101 - Metal cutting only.

200 WOOD INDUSTRY BASED:

20	1. Turning	2. Fine sanding
211	French polishing	
221	Upholstery	

Question 10(a) cont.

300 PRINTING INDUSTRY BASED:

30 Spec. printing on: 1. bags/packets; 2. Christmas cards; 3. Glass

31 1. Typesetting/photo-typesetting; 2. Specialised art work; 3. Plate work; 4. Four colour print processing; 5. Laminating

32 Other printing: 1. Electronic printed circuits

400 OTHER SUB-CONTRACT WORK

40 1. Fi-glass lining/coating; 2. Fi-glass pattern making

411 Slaughtering

421 Dyeing

500 Variety of processes spanning more than one group.

Question 11(d)

Range of customers:

1. Associated manufacturer (e.g. metal industry, wood industry, printing industry)
2. Other manufacturer
3. Non-manufacturer
4. Variety of customers.

Question 12

Input classification:

As per Question 2 above, plus

170 Agricultural produce (1. Grain crops; 2. Livestock; 3. Fruit and Vegetables; 4. Other).
e.g. 170 - undifferentiated agricultural produce. 172 - livestock only

180 Forest produce

190 Fishing produce

Question 12 cont.

200	Mining produce	(1. Metallic minerals; 2. Coal, Petroleum; 3. Construction materials; 4. Other non-metallic minerals)
210	Other non-manufactured inputs	

Energy inputs:

01	Electricity	06	Electricity/Oil/gas
02	Oil	07	Electricity/wood waste
03	Gas	08	Coal
04	Electricity/oil	10	Other
05	Electricity/gas		

Packaging inputs:

10	Paper products	1. paper; 2. packets; 3. paper board; 4. cartons; 5. liquid cartons e.g. 10 various paper products; 11 - paper wrapping only
20	Plastic products	1. sheet; 2. bags; 3. bottles; 4. trays; 5. other plastic
30	Glass products	1. bottles
40	Metal products	1. cans; 2. tins/pails; 3. foil containers; 4. wire strapping
50	Other	1. textile sacks; 2. wooden crates; 3. pallets; 4. protective film
60	Combinations	1. glass/metal/paper; 2. glass/plastic/paper; 3. plastic/metal; 4. plastic/ paper; 5. plastic/metal/ paper 6. other combinations
77	None	

Process related inputs:

1. Sand paper/abrasives/steel wool

2. Chemicals for cleaning/catalysts

Question 12 cont.

3. Other cleaning materials

4. Negatives/plates

5. Moulding sand/refractory material

6. Sand

7. Other

Energy/packaging/process related inputs as a proportion of total input costs:

1. < 5%

2. 5-25%

3. > 25%

Input category: (Predominantly defined as ≥60% share of total value of inputs)

1. Predominantly unprocessed raw material

2. Predominantly semi-manufactured goods

3. Predominantly fabricated components

4. Predominantly unprocessed plus semi-manufactured inputs

5. Predominantly semi-manufactured and fabricated components

6. Other

Degree of diversity of product related inputs: (Dominated defined as ≥60% share of total value of inputs)

1. Dominated by one input

2. Dominated by inputs from a single industrial group

3. Dominated by inputs from a single industrial sub-division

4. Dominated by inputs from two industrial sub-divisions

5. Wide range of inputs.

Question 13(c)

Part of input range:

As per Question 12 above, if single input or a limited range from a particular source area, plus

222 Inputs from more than one sub-division, but limited range

333 Virtually all inputs (>70%)

444 All inputs

555 Energy inputs only

666 Packaging material only

770 Process related inputs only

777 Accessories/incidentals only

Question 13(d)

Reason for purchase:

01 Cheapest source

02 Only source/closest available source

03 Most reliable source/more reliable to deal direct

04 To supplement existing source

05 Better quality material/specialised line

06 Group product/group purchase/under franchise arrangement

07 Most satisfactory/convenient source/readily available at reasonable price

08 One of a number of satisfactory sources

09 Prefer to deal locally

10 No alternative since unable to purchase in bulk

11 Deal direct when able to purchase in bulk

12 Wherever available at best price and quality

77 Other.

Question 13(e)

Initial source of inputs from Launceston wholesalers:

1. No knowledge
2. N. and N.E. Tasmania
3. Elsewhere in Tasmania
4. Mainland Australia
5. Tasmania and mainland Australia
6. Overseas
7. Mainland Australia and Overseas

Question 14(a)

Date of last purchase:

1. Pre 1960
2. 1960-69
3. 1970-75
4. 1976-80
5. No purchase since takeover of existing plant

Question 14(b)

Nature of machinery or equipment:

1. Process related equipment
2. Materials handling equipment
3. Materials storage equipment
4. Packaging equipment
5. Transport equipment
6. Other manufacturing related equipment
7. Other equipment for non-manufacturing activities of firm

Plus an additional variable - status of item purchased:

1. New
2. Second hand
3. Transfer within firm
4. Other (inc. leased)

Question 15(b)

Nature of sub-contracting out process(es):
As per Question 10(a) above.

Question 17(a)

The original intention was to code source areas for ancillary services as Launceston (L), Northern Tasmania (NT), Southern Tasmania (S), mainland Australia (M) and Overseas (O)

The data set was subsequently modified on the basis of the following regional source areas:

1. Launceston
2. Rest of North and North Eastern Tasmania
3. North West and Western Tasmania
4. Southern Tasmania
5. Victoria
6. Elsewhere mainland Australia
7. Overseas

Question 17(b)

The level of difficulty experienced by a substantial number of firms in trying to disaggregate and rank the costs of these services, particularly when internalised to the firm, rendered the information incomplete and unreliable. Only the most expensive ancillary service was coded.

A number of comments relevant to this data subset were also recorded and coded: (Values assigned by order of occurrence).

01 Maintenance and repair by equipment supplier

02 Retail purchase of printed requisites

03 Waste sold

04 Waste removed at no cost

05 Waste used as energy source

06 Waste recycled

07 Live on premises, provide own security

08 Only office cleaning contracted out

09 Outside Tasmania for repairs of specialised machinery only

10 Outside Tasmania for electronic repairs only

11 Waste removed by local council.

Question 18(a)

Regional source areas:

Modified as per Question 17(a) above.

Question 18(b)

Only the most expensive professional service was coded for the same reason expounded for Question 17(b) above.

Additional comments: (Values assigned by order of occurrence)

01 Used only rarely

02 Performed by wife

03 Bring someone in on a part-time basis

04 Advertising cost shared with retailer(s)

05 Advertise via infrequent newspaper supplements

06 Advertise in club, sports association etc. publications

07 Monitor industrial development and market trends 'by ear'

08 Advice provided by Industrial Association

09 Advice provided by major input supplier

10 Rarely find the time to assess developments and trends

11 Mutual interchange among 'like firms'

12 Advertise by mailing out stock sheets

13 Payroll service only contracted out

14 Dealers provide the advertising

15 Legal costs incurred when setting up only

Question 20(b)

Form of contact:

1. Trade journals/industrial association newsletters and information
2. Conferences/conventions/meetings (Industrial association and other)
3. Local business association activities

Question 20(b) cont.

4. Refresher courses
5. Visits from buying/selling agents OR visits by own buyers/sellers
6. Management tours
7. Specific management visits to other firms
8. Direct management contact (e.g. phone)
9. Visits from management of other firms
10. Government agencies
11. Consult expert advisers
12. No conscious effort made
13. Advertising of products
14. Utilise Group or Franchiser expertise
15. Tenders
16. Rely on developing reputation of firm

Question 21

Comments: (a maximum of six individual comments were coded)

10	Transport related:	1. Unreliability/damage; 2. Excessive cost; 3. Freight equalisation beneficial; 4. Freight equalisation not beneficial; 5. No problems unless there is a strike; 9. Other.
20	Labour force related:	1. Stable and responsible; 2. Shortage of skilled labour; 3. Difficult to obtain and retain reliable unskilled labour; 4. Labour force recruited pre 1970 stable, very high turnover among more recent appointments; 5. almost impossible to find someone with both technical expertise and management ability (or willing to take on a supervisory role); 9. Other.

30	Market related:	1. Launceston central to state market; 2. Launceston market small and static; 3. Fluctuation in demand a problem; 4. Difficult customer relations; 5. There exists an apparent mistrust of locally produced goods; 6. Best location from which to forward goods to external markets; 7. Good stable market; 8. Launceston retail operations not buying locally produced goods; 9. Other.
40	Inputs related:	1. Launceston provides the best access to statewide and external sources; 2. Poor service from Launceston wholesalers/carry insufficient stock; 3. Limited supplies of good quality timber; 4. Poor back-up service from local suppliers of specialised machinery; 9. Other.
50	Government related:	1. Poor government support for development/ promotion of products; 2. Too many purchases made outside Tasmania/local firms should get priority with tenders; 3. Iniquities of payroll tax/sales tax/ attitudes of Taxation department; 4. Too much regulatory control and interference; 5. No co-ordinated authority to provide advice to small businesses; 6. Requests for information unrealistic; 7. Problems created by amendments to zoning schemes; 8. Reasonable government support; 9. Other.
60	Other Comments:	1. Cash flow problems; 2. Lack of competitive spirit and business initiative in Launceston; 3. Lack of specialist services in Launceston; 4. No energy advantage to non-bulk users in Tasmania; 5. Prefer to be located elsewhere; 6. Good relations within Launceston business community/generally well served; 7. High communications cost in Launceston; 9. Other.

APPENDIX 4

DIVISIVE CLUSTER ANALYSIS, PROCEDURE DIVIDE

Procedure Divide is a cluster analysis method contained within the Clustan Package of related programs, Release 2 of Version 1C, developed by the Computer Centre, University College, London.[1] Divide is described as a monothetic divisive procedure specifically for use with binary data (Wishart, 1978, 59). Such a divisive procedure treats the entire population as the one group, and from there divides it into disjoint sub-groups based on inter-cluster similarity forming a classification, or perhaps more appropriately, a typology. The basis of the procedure is that if

> .... M binary attributes are measured for a population of N objects, then given any cluster of P objects, the most profitable division of the cluster into two subsets in terms of the presence or absence of one binary attribute T may be found. That is, one subset will contain those objects which possess T, the other will contain those objects which lack T, and attribute T is chosen so that the similarity between the two clusters S(+T, -T) is minimised in terms of the similarity criterion, measured over all attributes (Wishart, 1978, 59).

The specific process from procedure Divide by which the data set is partitioned in the exercise is known as nested division. This begins by seeking the attribute which isolates two sub-groups, the selection being determined on the basis of the presence or absence of that attribute which shows a lower similarity between the sub-groups than would any of the other attributes. The process then identifies the optimal division of each of these two sub-groups, producing four clusters at the second step, each of which is divided into two producing eight clusters at the third step, and so on, until the specified number of steps have been completed. Thus, at each progression from one step to the next, the number of clusters is

---

1 This, and all other Cluster analyses undertaken for the purposes of this study were run on a Burroughs B6700 Computer system at the University of Tasmania.

doubled unless clusters containing one object or a group of identical objects in terms of the criteria used in the analysis are encountered.

> To determine the optimum division for a particular cluster P of size NP, the frequencies of the unmasked attributes [those of relevance to the clustering process] are computed for the cluster subset P by scanning the original binary data file. Next, any attribute whose frequency is 0 or NP [that is, zero or total occurrence for a cluster] is further masked for this subset, since such an attribute cannot yield a profitable subdivision.
>
> For each unmasked attribute T the attribute frequencies for the subset of Cluster P which comprises those cases that possess T are computed. By subtraction, the frequencies of attributes for the complementary subset (those cases in P which lack T) are obtained, and the dissimilarity between the subsets in terms of the similarity criterion is computed. When all the divisible attributes have been considered the procedure divides subset P on that attribute T for which the similarity S(+T, -T) is a minimum (i.e. maximum dissimilarity) (Wishart, 1978, 60-61).

The similarity criterion adopted in this analysis is variously referred to as divisive information analysis, information gain statistic or simply the information statistic. It is chosen because it can be used with binary data to measure the similarity between two clusters, although in this case it is technically a coefficient of dissimilarity. The total information in a classification is obtained from the sum of the information statistics for each cluster, and divisive methods such as that adopted result in a maximum reduction of total information at each step in the classification. Accordingly, the attributes responsible for successive divisions are arranged in decreasing order of explanatory power, albeit within the successively partitioned sub-groups, and the similarity coefficient values at each level within the classification indicate their relative importance to the overall structure of the total population.

The Cluster diagnostic statistic is known as the binary frequencies ratio (B.F.R.) or percentage ratio.

$$B.F.R. = \frac{P(C,J)}{P(J)}$$

P(C,J) is the percentage occurrence of attribute J in Cluster C

P(J) is the percentage occurrence of attribute J overall.

A value of zero for the binary frequencies ratio indicates that the absence of the attribute is a key characteristic of the cluster. Values greater than 1.0 indicate that a greater presence of the attribute characterises the cluster.

Pictorial representation of the results of the cluster analysis is achieved using procedure Plink from the Clustan Package. The dendrogram is plotted with the resulting clusters aligned along the x-axis and cluster partitions shown against similarity coefficient values on the y-axis. No transformation of the absolute coefficient values is used.

APPENDIX 5

CLASSIFICATION OF REGIONAL SALES LINKAGES

A5.1 Agglomerative cluster analysis, procedure Hierarchy.

Procedure Hierarchy is an agglomerative cluster analysis technique from Release 2, Version 1C of the Clustan Package.

> Hierarchy starts with N clusters, each being a single individual, which are numbered according to the input order of the individuals. In each of N-1 fusion cycles the two clusters which are most similar are fused.... It has been suggested that the process can be stopped when a significant drop or discontinuity in the fusion coefficient value is observed (Wishart, 1978, 31).

Data input to the process is in the form of continuous variables which are transformed to standard scores, and Pearson product-moment correlations are computed. A similarity matrix is then computed which is 'a triangular array of N(N-1)/2 coefficients such that each element measures the similarity between two individuals' (Wishart, 1978, 21). The similarity criterion adopted for this analysis is the common measure of dissimilarity, squared euclidean distance, and this matrix of distances forms the input to procedure Hierarchy. The result is a fusion hierarchy by means of a 'variable combinatorial transformation of the similarity coefficients' (Wishart, 1978, 21), in this case Ward's error sum of squares method. This transformation, if Clusters P and Q are fused, is as follows:

$$S(R, P + Q) = AP*S(R, P) + AQ*S(R, Q) + B*S(P, Q) + G\,|S(R, P) - S(R, Q)|$$

$S(R, P + Q)$ = the similarity between any cluster R and the new cluster $(P + Q)$

$AP = (NR + NP)/(NR + NP + NQ)$ $\quad B = -NR/(NR + NP + NQ)$

$AQ = (NR + NQ)/NR + NP + NQ)$ $\quad G = 0$

NR, NP, NQ are cluster sizes.

> The error sum of squares is defined as the sum of the distances from each individual to the centroid of its parent cluster.... [and the method] combines those two clusters P and Q whose fusion yields the least increase in the error sum of squares.... This method finds minimum-variance spherical clusters (Wishart, 1978, 33-34).

The fusion coefficient value at each level within the classification indicates relative importance within the overall structure of the population.

The identification of the character of the resultant subsets is based on two cluster diagnostic statistics, the F-ratio and the T-value.

(i)
$$\text{F-ratio} = \frac{V(C,J)}{V(J)}$$

V(J) is the overall variance of variable J.

V(C,J) is the variance of variable J in Cluster C.

The expected value of the F-ratio is 1.0. Small F-ratios indicate relatively low variation within the cluster.

(ii)
$$\text{T-value} = \frac{[X(C,J) - X(J)]}{S(J)}$$

X(C,J) is the mean for variable J in Cluster C.

X(J) is the overall mean for variable J.

S(J) is the overall standard deviation for variable J.

The expected value of the T-value is zero. Large positive or negative T-values indicate variables with cluster means quite different from the overall population means of the particular variables.

Dendrograms are plotted without transformation of the coefficient values using procedure Plink from Clustan 1C.

A5.2 Structure of the classification of the sales linkages of Launceston manufacturers.

The classification of the regional sales patterns exhibits a marked change in character at the fusion coefficient of 21.138 (Figure A5.1). Above that cut-off in the classification structure, the differences in the fusion coefficient values after successive cycles are quite large. Below, fusions are numerous and the coefficient range separating each cycle is small. Furthermore, the segregation of increasing numbers of clusters in some cases involves very small numbers of firms and the definition of clusters becomes less meaningful, sometimes within divergent branches repetitive of patterns identified elsewhere at higher levels.

Obviously, the decision concerning the number of distinct clusters to form the basis of the classification is a difficult one, and forms the subject of considerable discussion resulting in different approaches in the practical application of multi-variate classificatory techniques (for example: Goddard, 1968; Spence, 1968; Knox, 1974) . Individual branches may exhibit interesting differentiation at lower levels in the structure, yet the benefits of this must be weighed against less meaningful divisions of the remaining branches at this level. Certainly, it is possible to impose some form of 'external' control by determining an arbitrary cluster inclusion limit, but for the current study this was found to be impractical. Another alternative is to avoid using a single cut-off, to terminate the structure at different levels where clusters may be considered to be of greater utility. This is also rejected on the grounds of imposing the order. More objective criteria which at the same time result in meaningful clusters are preferred.

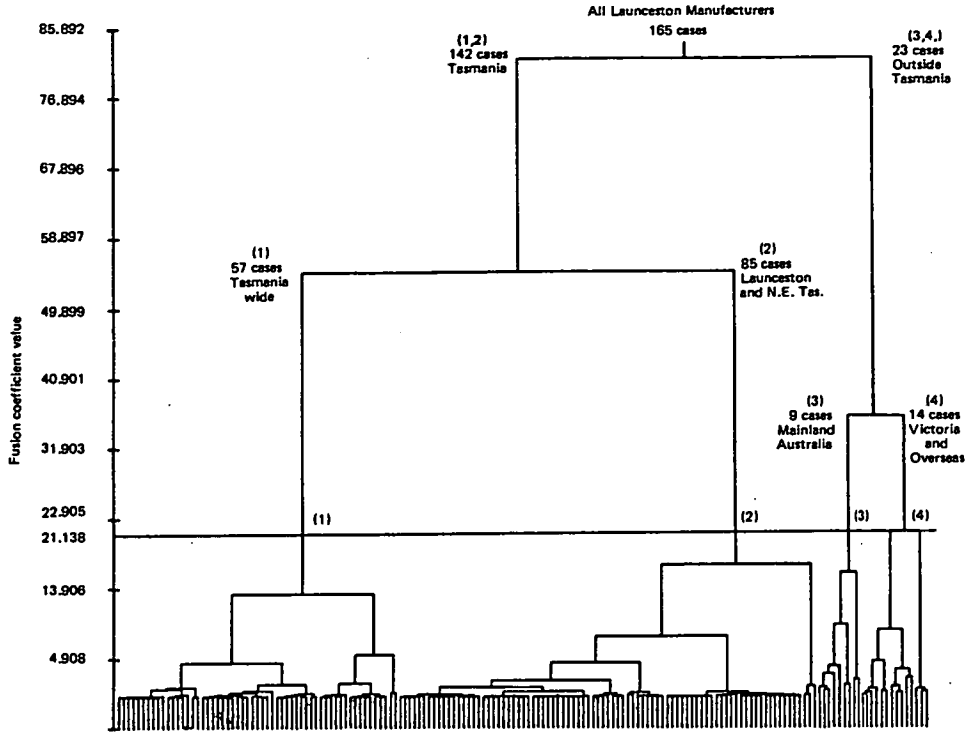


Figure A5.1: Dendrogram of regional sales linkages, Launceston manufacturers.

Thus, the procedure adopted for this and other equivalent analyses undertaken in the study is to seek the greatest discontinuity in fusion coefficient values, the natural breaks within the structure, as the most objective and logically the most efficacious means of determining the limits to the classification. However, care was taken in the use of this procedure to ensure that the incidence of discrimination of individual firms or very small clusters of individually very specialised but marginally divergent character is reduced, and that lower order clusters do not represent intricate permutations of higher order clusters resulting in an unnecessarily complex structure.

On these bases, the discontinuity in fusion coefficient values at the 21.138 level is used to group regional sales patterns into four clusters. The structure of the classification is as follows:

LEVEL 1

(i) Fusion coefficient : 81.8

(ii) No. of clusters : 1

(iii) Cluster identification : (1, 2, 3, 4) - 165 cases. All firms.

LEVEL 2

(i) Fusion coefficient : 54.6

(ii) No. of clusters : 2

(iii) Cluster identification : Cluster (1,2) - Tasmania; Cluster (3,4) - Outside Tasmania

(iv) Character of new clusters:

Cluster (1,2) - 142 cases. This cluster is characterised by an almost total restriction of sales to Tasmania. Mean sales to regional markets outside the state are all less than one percent, and there is almost no variation within the cluster for these regions. Sales to Launceston predominate, although there are substantial components of sales to each of the other Tasmanian regions, the mean value increasing slightly with increasing population size of the regions.

Cluster (3,4) - 23 cases. Fusion on the basis of sales predominantly to markets outside Tasmania occurred for Cluster (3,4). Sales to all of the external markets are well above the overall means. Nonetheless, there are considerable, yet below average, sales to the Tasmanian regions with an aggregated mean of 37.3 per cent. The relatively low within cluster variation for these variables demonstrates a reasonably consistent indigenous market component for most exporting firms.

(v) Cluster diagnostics:

Cluster (1,2)		142 Cases		All Firms			Cluster (3,4)		23 Cases	
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
0.8219	0.2041	64.12	26.70	Launceston	58.11	29.45	0.2586	-1.2599	21.00	14.98
1.0422	0.0712	9.56	10.08	N. & N.E.	8.86	9.87	0.5402	-0.4396	4.52	7.25
1.0438	0.0796	11.93	13.18	N.W. & W.	10.90	12.90	0.4717	-0.4912	4.57	8.86
1.1033	0.0513	13.63	18.30	S. Tas	12.73	17.42	0.2615	-0.3166	7.22	8.91
0.0228	-0.3233	0.56	2.26	Victoria	5.40	14.96	2.4675	1.9963	35.26	23.50
0.0269	-0.2442	0.14	0.98	NSW/ACT	1.60	5.97	4.5203	1.5079	10.61	12.70
0.0034	-0.2458	0.01	0.17	W.A./S.A.	0.72	2.88	4.6349	1.5176	5.09	6.19
0.0010	-0.2139	0.01	0.08	Qld./N.T.	0.58	2.69	5.3297	1.3206	4.13	6.20
0.0020	-0.1879	0.03	0.26	Overseas	1.08	5.59	5.8056	1.1600	7.57	13.47

Source: Launceston manufacturing survey, 1980.

LEVEL 3

(i) Fusion coefficient : 35.9

(ii) No. of Clusters : 3

(iii) Cluster identification : Cluster (1) - Tasmania wide; Cluster (2) - Launceston and North Eastern Tasmania; Cluster (3,4).

(iv) Character of new clusters:

Cluster (1) - 57 cases. Cluster 1 is characterised by a sales pattern that is distinctly statewide in its market orientation. Apart from a slight preponderance of sales to Launceston, production from this subset of firms is distributed over the entire state in proportions that reflect the population base of the regions. Mean sales by regional market are Launceston (39.6 per cent), rest of North and North Eastern Tasmania (5.6 per cent), North West and Western Tasmania (24.5 per cent), and Southern Tasmania (29.1 per cent), with above average sales in the latter two, more distant markets only.

Cluster (2) - 85 cases. This cluster contains the firms that are restricted in their penetration to localised markets. Sales to both Launceston ($\bar{x}$ = 80.6 per cent) and the Rest of North and North Eastern Tasmania ($\bar{x}$ = 12.2 per cent) are above average, defining a market area of Launceston and its immediate hinterland.

(v) Cluster diagnostics:

Cluster (1)		57 Cases		All firms			Cluster (2)		85 Cases	
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
0.4139	-0.6285	39.60	18.95	Launceston	58.11	29.45	0.3178	0.7624	80.56	16.60
0.2378	-0.3254	5.65	4.81	N. & N.E.	8.86	9.87	1.4126	0.3372	12.19	11.73
0.7314	1.0518	24.47	11.03	N.W. & W.	10.90	12.90	0.1929	-0.5724	3.52	5.67
1.2731	0.9367	29.05	19.66	S. Tas	12.73	17.42	0.1146	-0.5425	3.28	5.90
0.0399	-0.3047	0.84	2.99	Victoria	5.40	14.96	0.0113	-0.3358	0.38	1.59
0.0655	-0.2091	0.35	1.53	NSW/ACT	1.60	5.97	0.0000	-0.2678	0.00	0.00
-0.0000	-0.2507	0.00	0.00	W.A./S.A.	0.72	2.88	0.0057	-0.2425	0.02	0.22
0.0000	-0.2165	0.00	0.00	Qld./N.T.	0.58	2.69	0.0016	-0.2121	0.01	0.11
0.0006	-0.1898	0.02	0.13	Overseas	1.08	5.59	0.0034	-0.1866	0.04	0.33

Source: Launceston manufacturing survey, 1980.

LEVEL 4

(i) Fusion coefficient : 21.1

(ii) No. of clusters : 4

(iii) Cluster identification : - Cluster (1); Cluster (2); Cluster (3) - Mainland Australia; Cluster (4) - Victoria and Overseas.

(iv) Character of new clusters:

Cluster (3) - 9 cases. Cluster 3 displays above average sales to all external markets except those overseas. Mean aggregated sales to mainland Australia are 65.9 per cent, concentrated predominantly in the

closer markets of Victoria ($\bar{x}$ = 27.0 per cent) and New South Wales/Australian Capital Territory ($\bar{x}$ = 20.2 per cent). Nonetheless, there are relatively substantial sales (well above average) to the more distant Australian markets emphasising a national sales pattern.

Cluster (4) - 14 cases. The external orientation of this cluster exhibits a markedly high proportion of sales to Victoria ($\bar{x}$ = 40.6 per cent) and direct to overseas markets ($\bar{x}$ = 12.3 per cent).

(v)Cluster diagnostics:

Cluster 3		9 Cases		All firms			Cluster 4		14 Cases	
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
0.2133	-1.3806	17.44	13.60	Launceston	58.11	29.45	0.2902	-1.1823	23.29	15.87
0.9618	-0.4137	4.78	9.68	N. & N.E.	8.86	9.87	0.3216	-0.4563	4.36	5.60
0.0848	-0.6987	1.89	3.76	N.W. & W.	10.90	12.90	0.6972	-0.3579	6.29	10.77
0.2692	-0.1696	9.78	9.04	S. Tas	12.73	17.42	0.2523	-0.4111	5.57	8.75
1.0894	1.4440	27.00	15.61	Victoria	5.40	14.96	3.1585	2.3513	40.57	26.58
5.8260	3.1170	20.22	14.42	NSW/ACT.	1.60	5.97	1.1194	0.4735	4.43	6.32
6.4582	2.8006	8.78	7.31	W.A./S.A.	0.72	2.88	1.9972	0.6928	2.71	4.07
5.9707	3.4636	9.89	6.57	Qld./N.T.	0.58	2.69	0.1218	-0.0570	0.43	0.94
0.0142	-0.1532	0.22	0.67	Overseas	1.08	5.59	7.8548	2.0042	12.29	15.67

Source: Launceston manufacturing survey, 1980.

A5.3 Structure of the classification of the sales linkages of Launceston only manufacturers.

Launceston only manufacturers (N = 121) differ from the entire population of firms in regional sales links by exhibiting a slightly greater propensity for sales to Launceston and to the rest of North and North Eastern Tasmania. Elsewhere, mean sales are lower than the overall mean. Thus, spatially dispersed sales linkages are less prevalent for this sub-population of firms (Table A5.1).

Table A5.1: Means and standard deviations of the regional sales linkage data set, Launceston only manufacturers.

Region	Launceston only		All firms
	Mean[1]	Standard Deviation	Mean[1]
Launceston	64.75	27.62	58.11
Rest of N. and N.E. Tasmania	9.26	10.89	8.86
N.W. and W. Tasmania	9.71	12.68	10.90
Southern Tasmania	10.62	16.43	12.73
Victoria	3.45	11.50	5.40
N.S.W./A.C.T.	0.82	3.59	1.60
W.A./S.A.	0.55	2.46	0.72
Qld./N.T.	0.50	2.78	0.58
Overseas	0.32	3.28	1.08
No. of firms	121		165

1. The mean of the percentage of total value of sales to the regions.
Source: Launceston manufacturing survey, 1980.

Inter-variable correlations highlight the importance of a distinct subset of these firms concentrating on the local, urban Launceston market.

High sales components to Launceston are associated with relatively low sales to North West and Western Tasmania (r = -0.5946), Southern Tasmania (r = -0.6655), Victoria (r = -0.4087), and New South Wales/Australian Capital Territory (r = -0.3926). High positive correlations exist between New South Wales/ Australian Capital Territory and Western Australia/South Australia (r = 0.8730), and the latter with Queensland/Northern Territory (r = 0.4950), indicating for these firms also that any sales penetration beyond Victoria tends to be to the entire Australia market.

The dendrogram of the classification structure of Launceston only firms based on regional sales patterns displays a substantial discontinuity in fusion coefficient at the value of 26.627 (Figure A5.2). However, for the main branch of the classification the most substantial discontinuity occurs at a coefficient of 14.680, suggesting an alternative cut-off point. But within this range complex differentiations of a very small subset of firms (parent cluster 3) exist. These additional clusters involve only small numbers of firms with very specific sales patterns which add no practical value to the analysis. The distinctive Victorian/Overseas association emerging in the classification of all firms does not emerge at any level within this structure. Thus, the limit to the classification is established at the coefficient value of 26.627 resulting in a structure based on three distinct clusters.

The structure of the classification is as follows:

LEVEL 1

(i) Fusion coefficient : 59.7

(ii) No. of clusters : 1

(iii) Cluster identification : (1,2,3) - 121 cases. All Launceston only firms.

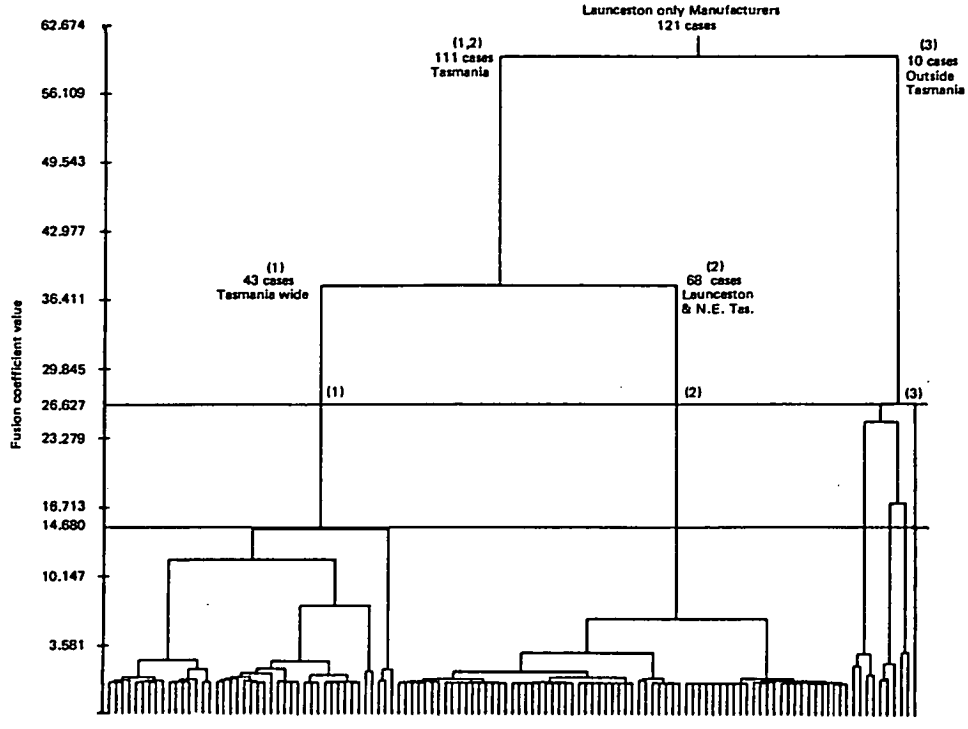


Figure A5.2: Dendrogram of regional sales linkages, Launceston only manufacturers.

LEVEL 2

(i) Fusion coefficient : 37.8

(ii) No. of clusters : 2

(iii) Cluster identification : Cluster (1,2) - Tasmania; Cluster (3) - Outside Tasmania.

(iv) Character of new clusters:

Cluster (1,2) - 111 cases. Sales to non-Tasmanian markets are virtually non-existent ($\bar{x}$ = 0.9 per cent) for this subset of firms. Whilst Launceston is the dominant market area ($\bar{x}$ = 68.5 per cent), remaining sales are distributed in almost equal proportions across the Tasmanian regions.

Cluster (3) - 10 cases. Sales to all external markets are above

average for these firms, but in common with the overall pattern, external sales are concentrated in Victoria ($\bar{x}$ = 34.2 per cent).

(v) Cluster diagnostics:

Cluster (1,2)		111 Cases		Launceston only manufacturers			Cluster (3)		10 Cases	
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
0.8483	0.1372	68.54	25.43	Launceston	64.75	27.62	0.1565	-1.5228	22.70	10.92
1.0084	0.0436	9.74	10.93	N. & N.E.	9.26	10.89	0.7258	-0.4836	4.00	9.27
1.0288	0.0356	10.16	12.86	N.W. & W.	9.71	12.68	0.5696	-0.3952	4.70	9.57
1.0680	0.0018	10.65	16.98	S. Tas.	10.62	16.43	0.2792	-0.0195	10.30	8.68
0.0482	-0.2408	0.68	2.53	Victoria	3.45	11.50	4.0897	2.6730	34.20	23.26
0.0947	-0.1776	0.18	1.11	NSW/ACT	0.82	3.59	7.4668	1.9717	7.90	9.81
0.0060	-0.2181	0.02	0.19	W.A./S.A.	0.55	2.46	6.1611	2.4210	6.50	6.10
0.0000	-0.1811	0.00	0.00	Qld./N.T.	0.50	2.78	8.4408	2.0098	6.10	8.09
0.0075	-0.0900	0.03	0.28	Overseas	0.32	3.28	12.0331	0.9987	3.60	11.38

Source: Launceston manufacturing survey, 1980.

LEVEL 3

(i) Fusion coefficient : 22.6

(ii) No. of clusters : 3

(iii) Cluster identification : Cluster (1) - Tasmania wide; Cluster (2) - Launceston and North Eastern Tasmania; Cluster (3).

(iv) Character of new clusters:

Cluster (1) - 43 cases. Cluster 1 is characterised by a sales pattern quite definitely oriented to the entire statewide market, with sales to North West and Western Tasmania, and Southern Tasmania averaging 21.9 and 24.7 per cent respectively. As before, the regional proportions are not exactly the same as the regional population proportions because of

a natural dominance within the city of origin, yet the relativities are present.

Cluster (2) - 68 cases. Sales outside the Northern and North Eastern Tasmania region are minimal for Cluster 2. Mean sales of 84.3 per cent to Launceston and 10.7 per cent to the remainder of the local region demonstrate an exceedingly strong local orientation.

(v) Cluster diagnostics:

Cluster (1)			43 Cases	Launceston only manufacturers			Cluster (2)			68 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
0.6237	-0.7666	43.58	21.81	Launceston	64.75	27.62	0.1459	0.7087	84.32	10.55
1.5927	-0.0905	8.28	13.74	N. & N.E.	9.26	10.89	0.6382	0.1284	10.66	8.70
1.1320	0.9583	21.86	13.49	N.W. & W.	9.71	12.68	0.0877	-0.5478	2.76	3.75
1.5234	0.8570	24.70	20.28	S. Tas.	10.62	16.43	0.0318	-0.5390	1.76	2.93
0.0871	-0.2094	1.05	3.39	Victoria	3.45	11.50	0.0236	-0.2607	0.46	1.77
0.2375	-0.0983	0.47	1.75	NSW/ACT.	0.82	3.59	0.0000	-0.2278	0.00	0.00
0.0000	-0.2254	0.00	0.00	W.A./S.A.	0.55	2.46	0.0098	-0.2135	0.03	0.24
-0.0000	-0.1811	0.00	0.00	Qld./N.T.	0.50	2.78	-0.0000	-0.1811	0.00	0.00
0.0194	-0.0770	0.07	0.46	Overseas	0.32	3.28	-0.0000	-0.0982	0.00	0.00

Source: Launceston manufacturing survey, 1980.

A5.4 Structure of the classification of the sales linkages of multi-locational Launceston manufacturers.

Multi-locational firms operating in Launceston (N = 44) diverge from the overall sales pattern of Launceston manufacturers by a reduced dependence on sales to the localised market of Launceston and North and North Eastern Tasmania, and a concomitantly greater penetration of all markets beyond the region of origin (Table A5.2).

Table A5.2: Means and standard deviations of the regional sales linkage data set, multi-locational Launceston manufacturers.

Region[1]		Multi-locational firms			All firms
		Mean[2]	Standard Deviation	Regional Mean	Mean
Launceston		39.84	26.74	39.84	58.11
Rest of N. and N.E. Tas	- other firms	7.48	6.01	7.75	8.86
	- own firm	0.27	1.53		
N.W. and W. Tas	- other firms	10.30	12.73	14.19	10.90
	- own firm	3.89	9.53		
Southern Tasmania	- other firms	9.41	16.96	18.55	12.73
	- own firm	9.14	15.25		
Victoria	- other firms	8.50	18.19	10.75	5.40
	- own firm	2.25	10.01		
N.S.W./A.C.T.	- other firms	3.30	9.36	3.76	1.60
	- own firm	0.45	3.02		
W.A./S.A.	- other firms	1.09	3.75	1.18	0.72
	- own firm	0.09	0.60		
Qld./N.T.	- other firms	0.77	2.42	0.79	0.58
	- own firm	0.02	0.15		
Overseas	- other firms	3.16	9.12	3.16	1.08
	- own firm	0.00			
No. of firms		44		44	165

[1] Note: In this regional breakdown, sales to other firms and intra-organisational sales are treated as separate entities, (not a segregation of the 'own firm' component from the regional total as in preceding analyses) since the analysis is concerned with organisational and regional variations.

[2] The mean of the percentage of total value of sales to other firms or within the organisation by region.

Source: Launceston manufacturing survey, 1980.

The reduced orientation to the immediately localised market is emphasised by the negative correlation between sales to Victoria and those to Launceston ($r = -0.4801$) and the rest of North and North Eastern Tasmania ($r = -0.4591$). Further, strong positive correlations between sales to North West and Western Tasmania, and Southern Tasmanian ($r = 0.5103$ for sales to independent firms, and $r = 0.7059$ for sales to branches or subsidiaries), suggest that a large proportion of firms which do establish markets outside North Eastern Tasmania operate to the entire state market, and emphasise the role of intra-firm transfers in catering to this market. Strong correlations among mainland Australian markets exist for sales to independent customers only, highlighting the predominant restriction of intra-organisational sales interaction within Tasmania. The most important relationships among mainland markets are shown in Table A5.3.

Table A5.3: The highest numeric variable correlations among mainland Australian markets for multi-locational Launceston manufacturers.[1]

	N.S.W./A.C.T.	W.A./S.A.	Qld./N.T.
Victoria	0.4285		0.4179
N.S.W./A.C.T.		0.4652	0.9085
W.A./S.A.			0.4198

1. Pearson's product-moment correlation coefficients: $-0.4 \geq r \geq +0.4$

These associations indicate that multi-locational firms operating to the Victorian market also tend to operate to a market encompassing the

Eastern Australian states, but if penetration to the New South Wales market is substantial, then a distinctive orientation to the entire national market exists.

The classification of this data set results in the structure portrayed in Figure A5.3. The boundary to the classification is established at the discontinuity in fusion cycles at the coefficient of 5.510, resulting in five discrete sub-groups of the population of multi-locational Launceston manufacturers.

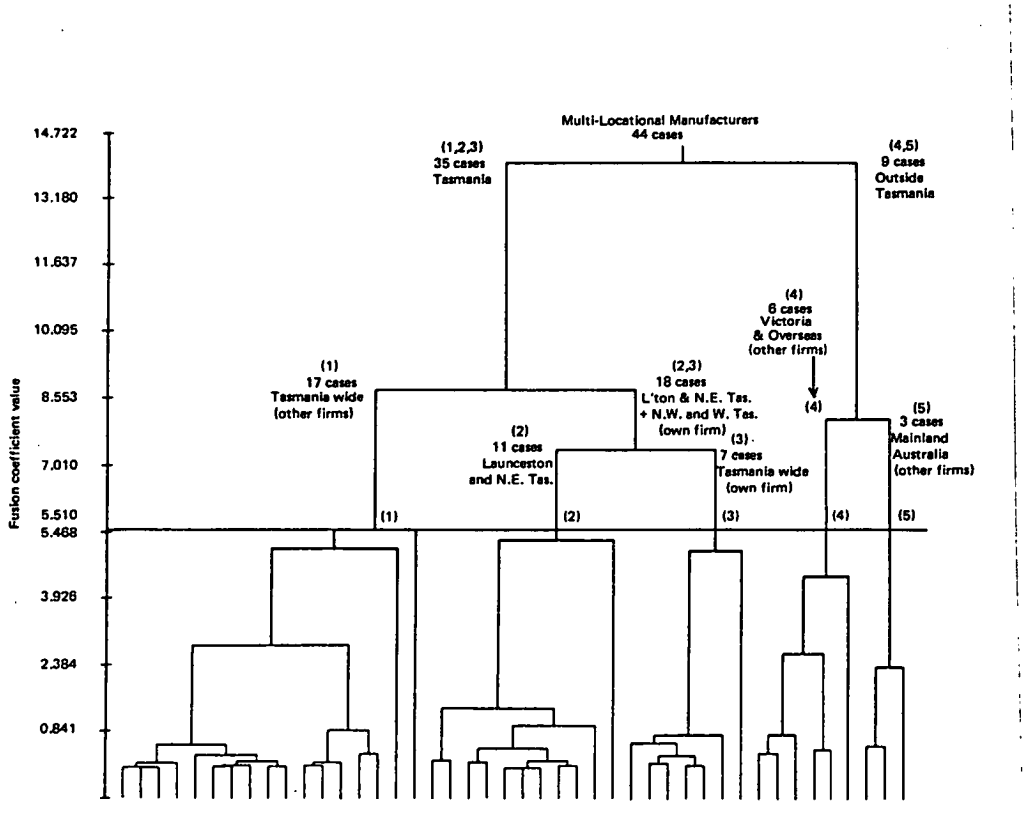


Figure A5.3: Dendrogram of regional sales linkages, multi-locational Launceston manufacturers.

The structure of the classification is as follows:

LEVEL 1

(i) Fusion coefficient : 14.0

(ii) No. of clusters : 1

(iii) Cluster identification : (1,2,3,4,5,) - 44 cases. All multi-locational Launceston manufacturers.

LEVEL 2

(i) Fusion coefficient : 8.7

(ii) No. of clusters : 2

(iii) Cluster identification : Cluster (1,2,3) - Tasmania Cluster (4,5) - Outside Tasmania.

(iv) Character of new clusters:

Cluster (1,2,3,) - 35 cases. This is the larger cluster for which sales to each of the Tasmanian regional markets are above average, more so for Launceston ($\bar{x}$ = 46.3 per cent) and the rest of North and North Eastern Tasmania ($\bar{x}$ = 9.3 per cent), and sales through the organisation are of considerable importance within the more distant markets, especially Southern Tasmania ($\bar{x}$ = 11.2 per cent).

Cluster (4,5) - 9 cases. The nine firms of this cluster collectively display an external orientation which is quite strong relative to that exhibited by the equivalent cluster for Launceston only firms, and the population of firms overall. Aggregated sales to external markets for multi-locational firms average 78.3 per cent, compared with 58.3 per cent for Launceston only firms and 62.7 per cent for all firms. The most important outlets are provided by independent buyers in Victoria ($\bar{x}$ = 36.9 per cent), Overseas ($\bar{x}$ = 15.1 per cent) and New South Wales/ Australian Capital Territory ($\bar{x}$ = 13.8 per cent).

(v)Cluster diagnostics:

Cluster (1,2,3)			35 Cases	Multi-locational Launceston manufacturers			Cluster (4,5)			9 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
0.9296	0.2421	46.31	25.78	Launceston	39.84	26.74	0.1703	-0.9415	14.67	11.03
0.9121	0.2534	9.00	5.74	N. & N.E.	7.48	6.01	0.1254	-0.9854	1.56	2.13
1.2197	0.0085	0.29	1.69	N. & N.E.(IF)	0.27	1.53	0.1899	-0.0330	0.22	0.67
1.0837	0.1811	12.60	13.25	N.W. & W.	10.30	12.73	0.0679	-0.7042	1.33	3.32
1.2159	0.0958	4.80	10.51	N.W. & W.(IF)	3.89	9.53	0.0110	-0.3727	0.33	1.00
1.1728	0.1056	11.20	18.37	S. Tas.	9.41	16.96	0.1522	-0.4107	2.44	6.62
1.1613	0.1353	11.20	16.44	S. Tas (IF)	9.14	15.25	0.0478	-0.5262	1.11	3.33
0.0767	-0.4012	1.20	5.04	Victoria	8.50	18.19	1.6053	1.5604	36.89	23.05
1.2022	-0.0278	1.97	10.98	Victoria(IF)	2.25	10.01	0.2493	0.1082	3.33	5.00
0.0458	-0.2879	0.60	2.00	NSW/ACT	3.30	9.36	3.4076	1.1196	13.78	17.28
-0.0000	-0.1508	0.00	0.00	NSW/ACT (IF)	0.45	3.02	4.8889	0.5863	2.22	6.67
0.3106	-0.1536	0.51	2.09	W.A./S.A.	1.09	3.75	3.5500	0.5975	3.33	7.07
1.2571	0.0388	0.11	0.68	W.A./S.A.(IF)	0.09	0.60	0.0000	-0.1508	0.00	0.00
0.0049	-0.3076	0.03	0.17	Qld./N.T.	0.77	2.42	3.3310	1.1961	3.67	4.42
1.2571	0.0388	0.03	0.17	Qld./N.T.(IF)	0.02	0.15	0.0000	-0.1508	0.00	0.00
0.0017	-0.3370	0.09	0.37	Overseas	3.16	9.12	2.9384	1.3106	15.11	15.63
0.0000	0.0000	0.00	0.00	Overseas (IF)	0.00	0.00	0.0000	0.0000	0.00	0.00

(IF) = Intra-firm.

Source: Launceston manufacturing survey, 1980.

LEVEL 3

(i) Fusion coefficient : 8.1

(ii) No. of clusters : 3

(iii) Cluster identification : Cluster (1) - Tasmania wide (other firms); Cluster (2,3) - Launceston and the Rest of North and North Eastern Tasmania, plus North West and Western Tasmania and Southern Tasmania (own firm); Cluster (4,5).

(iv) Character of new clusters:

Cluster (1) - 17 cases. These multi-locational operations exhibit a statewide market orientation which involves very little in the way of intra-organisational transfers. Sales are directed to independent

buyers in Launceston ($\bar{x}$ = 34.4 per cent), North West and Western Tasmania ($\bar{x}$ = 25.4 per cent) and Southern Tasmania ($\bar{x}$ = 22.8 per cent) predominantly.

Cluster (2,3) - 18 cases. This subset of multi-locational operations is characterised by an essentially Tasmanian oriented-Launceston dominant sales pattern, yet there is a marked variation from the character of the Tasmanian orientation identified immediately above. Sales to Launceston ($\bar{x}$ = 57.6 per cent) and to the rest of North and North Eastern Tasmania ($\bar{x}$ = 10.4 per cent) are above average, resulting in the propensity towards localised market dependence. Total sales to North West and Western Tasmania ($\bar{x}$ = 9.9 per cent) and Southern Tasmania ($\bar{x}$ = 15.6 per cent) are almost entirely intra-organisational transfers, with mean values of 9.3 per cent and 15.3 per cent respectively.

(v) Cluster diagnostics:

Cluster (1)			17 Cases	Multi-locational Launceston manufacturers			Cluster (2,3)			18 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
0.2834	-0.2053	34.35	14.23	Launceston	39.84	26.74	1.2033	0.6646	57.61	29.33
0.3742	-0.0011	7.47	3.68	N. & N.E.	7.48	6.01	1.3461	0.4937	10.44	6.97
2.5111	0.2061	0.59	2.43	N. & N.E.(IF)	0.27	1.53	0.0000	-0.1782	0.00	0.00
0.1921	1.1831	25.35	5.58	N.W. & W.	10.30	12.73	0.0343	-0.7653	0.56	2.36
0.0000	-0.4076	0.00	0.00	N.W. & W.(IF)	3.89	9.53	1.9389	0.5713	9.33	13.28
1.5185	0.7909	22.82	20.90	S. Tas.	9.41	16.96	0.0031	-0.5417	0.22	0.94
0.8212	-0.1516	6.82	13.82	S. Tas. (IF)	9.14	15.25	1.3897	0.4063	15.33	17.98
0.1393	-0.3767	1.65	6.79	Victoria	8.50	18.19	0.0212	-0.4245	0.78	2.65
-0.0000	-0.2247	0.00	0.00	Victoria (IF)	2.25	10.01	2.3290	0.1581	3.83	15.28
0.0329	-0.3080	0.41	1.70	NSW/ACT	3.30	9.36	0.0598	-0.2689	0.78	2.29
-0.0000	-0.1508	0.00	0.00	NSW/ACT (IF)	0.45	3.02	-0.0000	-0.1508	0.00	0.00
0.0042	-0.2750	0.06	0.24	W.A./S.A.	1.09	3.75	0.5886	-0.0390	0.94	2.88
2.5882	0.2394	0.24	0.97	W.A./S.A.(IF)	0.09	0.60	-0.0000	-0.1508	0.00	0.00
0.0100	-0.2951	0.06	0.24	Qld/N.T.	0.77	2.42	-0.0000	-0.3194	0.00	0.00
-0.0000	-0.1508	0.00	0.00	Qld/N.T. (IF)	0.02	0.15	2.4444	0.2178	0.06	0.24
0.0007	-0.3400	0.06	0.24	Overseas	3.16	9.12	0.0027	-0.3342	0.11	0.47
0.0000	0.0000	0.00	0.00	Overseas (IF)	0.00	0.00	0.0000	0.0000	0.00	0.00

(IF) = Intra-firm.

Source: Launceston manufacturing survey, 1980.

LEVEL 4

(i) Fusion coefficient : 7.4

(ii) No. of clusters : 4

(iii) Cluster identification : Cluster (1); Cluster (2,3); Cluster (4) - Victoria and Overseas (other firms); Cluster (5) - Mainland Australia (other firms).

(iv) Character of new clusters:

Cluster (4) - 6 cases. Definition of the Victorian/Overseas form of external orientation for this cluster is determined by mean sales to independent buyers in Victoria of 41.5 per cent and in overseas markets of 22.3 per cent. Intra-organisational sales in these external markets are minimal.

Cluster (5) - 3 cases. Sales from these firms to independent buyers in each of the mainland Australian markets are well above average, with an aggregated mean of 79.3 per cent. Intra-firm sales are negligible, as are overseas sales, resulting in a national market orientation.

(v) Cluster diagnostics:

Cluster (4)			6 Cases	Multi-locational Launceston manufacturers			Cluster (5)			3 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
0.1054	-0.8231	17.83	8.68	Launceston	39.84	26.74	0.2914	-1.1784	8.33	14.43
0.1080	-0.9946	1.50	1.97	N. & N.E.	7.48	6.01	0.2307	-0.9669	1.67	2.89
0.2846	0.0396	0.33	0.82	N. & N.E.(IF)	0.27	1.53	0.0000	-0.1782	0.00	0.00
0.0988	-0.6518	2.00	4.00	N.W. & W.	10.30	12.73	0.0000	-0.8089	0.00	0.00
0.0165	-0.3552	0.50	1.22	N.W. & W.(IF)	3.89	9.53	0.0000	-0.4076	0.00	0.00
0.0023	-0.5351	0.33	0.82	S. Tas.	9.41	16.96	0.4635	-0.1617	6.67	11.55
0.0716	-0.4897	1.67	4.08	S. Tas. (IF)	9.14	15.25	-0.0000	-0.5990	0.00	0.00
2.0396	1.8138	41.50	25.98	Victoria	8.50	18.19	0.7442	1.0535	27.67	15.70
0.2659	0.1082	3.33	5.16	Victoria (IF)	2.25	10.01	0.3324	0.1082	3.33	5.77
0.4126	-0.0494	2.83	6.01	NSW/ACT	3.30	9.36	0.3004	3.4576	35.67	5.13
7.3333	0.9548	3.33	8.17	NSW/ACT (IF)	0.45	3.02	0.0000	-0.1508	0.00	0.00
1.1833	0.1534	1.67	4.08	W.A./S.A.	1.09	3.75	9.4666	1.4857	6.67	11.55
0.0000	-0.1508	0.00	0.00	W.A./S.A.(IF)	0.09	0.60	0.0000	-0.1508	0.00	0.00
0.3018	0.0250	0.83	1.33	Qld/N.T.	0.77	2.42	0.2278	3.5381	9.33	1.15
0.0000	-0.1508	0.00	0.00	Qld/N.T. (IF)	0.02	0.15	0.0000	-0.1508	0.00	0.00
2.4371	2.1026	22.33	14.24	Overseas	3.16	9.12	0.0160	-0.2733	0.67	1.15
0.0000	0.0000	0.00	0.00	Overseas (IF)	0.00	0.00	0.0000	0.0000	0.00	0.00

(IF) = Intra-firm.

Source: Launceston manufacturing survey, 1980.

LEVEL 5

(i) Fusion coefficient : 5.5

(ii) No. of clusters : 4

(iii) Cluster identification : Cluster (1); Cluster (2) - Launceston and the rest of North and North Eastern Tasmania; Cluster (3) - Tasmania wide (own firm); Cluster (4); Cluster (5).

(iv) Character of new clusters:

Cluster (2) - 11 cases. These firms are oriented to the immediate local market of Launceston ($\bar{x}$ = 74.7 per cent) and the rest of North and North Eastern Tasmania ($\bar{x}$ = 12.8 per cent).

Cluster (3) - 7 cases. Cluster 3 is characterised by a Tasmania wide sales orientation in which sales to the more distant Tasmanian markets are dominated almost entirely by sales to branches or subsidiaries located within these regions. Aggregated Tasmanian sales average 95.7 per cent, of which 57.7 per cent are intra-firm transfers to North West and Western Tasmania, and Southern Tasmania.

(v) Cluster diagnostics:

Cluster (2)			11 Cases	Multi-locational Launceston manufacturers			Cluster (3)			7 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
0.7020	1.3048	74.73	22.40	Launceston	39.84	26.74	0.3076	-0.3413	30.71	14.83
1.5939	0.8887	12.82	7.59	N. & N.E.	7.48	6.01	0.4219	-0.1270	6.71	3.90
0.0000	-0.1782	0.00	0.00	N. & N.E.(IF)	0.27	1.53	0.0000	-0.1782	0.00	0.00
0.0561	-0.7375	0.91	3.02	N.W. & W.	10.30	12.73	0.0000	-0.8089	0.00	0.00
0.1000	-0.3123	0.91	3.02	N.W. & W.(IF)	3.89	9.53	1.6461	1.9599	22.57	12.23
-0.0000	-0.5548	0.00	0.00	S. Tas.	9.41	16.96	0.0079	-0.5211	0.57	1.51
0.1798	-0.4202	2.73	6.47	S. Tas. (IF)	9.14	15.25	0.4176	1.7051	35.14	9.86
0.0025	-0.4522	0.27	0.90	Victoria	8.50	18.19	0.0522	-0.3808	1.57	4.16
3.8300	0.3654	5.91	19.60	Victoria (IF)	2.25	10.01	0.0128	-0.1676	0.57	1.13
0.0373	-0.2937	0.55	1.81	NSW/ACT	3.30	9.36	0.1043	-0.2299	1.14	3.02
-0.0000	-0.1508	0.00	0.00	NSW/ACT (IF)	0.45	3.02	0.0000	-0.1508	0.00	0.00
0.7810	-0.0242	1.00	3.32	W.A./S.A.	1.09	3.75	0.3651	-0.0623	0.86	2.27
-0.0000	-0.1508	0.00	0.00	W.A./S.A.(IF)	0.09	0.60	0.0000	-0.1508	0.00	0.00
-0.0000	-0.3194	0.00	0.00	Qld/N.T.	0.77	2.42	-0.0000	-0.3194	0.00	0.00
-0.0000	-0.1508	0.00	0.00	Qld/N.T. (IF)	0.02	0.15	6.2857	0.7969	0.14	0.38
0.0044	-0.3265	0.18	0.60	Overseas	3.16	9.12	0.0000	-0.3464	0.00	0.00
0.0000	0.0000	0.00	0.00	Overseas (IF)	0.00	0.00	0.0000	0.0000	0.00	0.00

(IF) = Intra-firm.

Source: Launceston manufacturing survey, 1980.

APPENDIX 6

CLASSIFICATION OF MARKET SECTOR LINKAGES

A6.1 Structure of the classification of the market sector linkages of Launceston only manufacturers.

When the sub-group of firms operating in Launceston only are classified according to the market sector distribution of their sales, a substantial discontinuity exists between the fusion to seven clusters at a coefficient of 5.620 and the fusion to six clusters at a coefficient of 21.191 (Figure A6.1).2

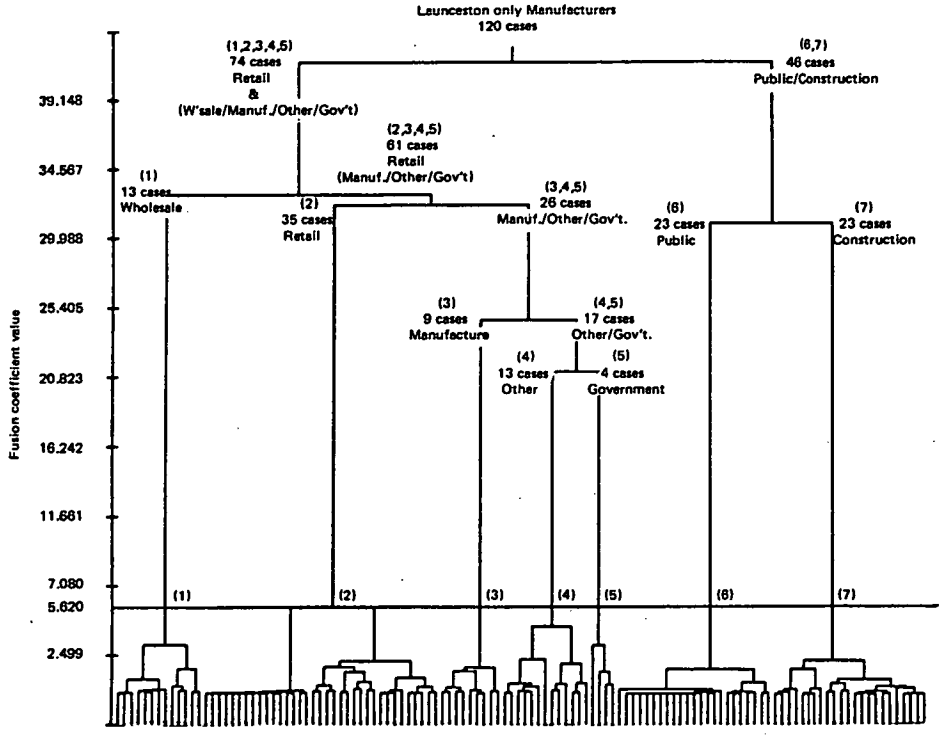


Figure A6.1: Dendrogram of market sector linkages, Launceston only manufacturers.

Thus, a differentiation of this particular sub-population of firms into seven discrete clusters forms the basis of the classification, the structure of which is as follows:

---

2 The procedure adopted for the classification of market sector linkages is the same as that for regional sales linkages, agglomerative cluster analysis, procedure Hierarchy (Refer Appendix 5.1).

LEVEL 1

(i) Fusion coefficient : 41.6

(ii) No. of clusters : 1

(iii) Cluster identification : (1,2,3,4,5,6,7) - 120 cases. All Launceston only firms.

LEVEL 2

(i) Fusion coefficient : 32.9

(ii) No. of clusters : 2

(iii) Cluster identification : Cluster (1,2,3,4,5) - Retail and Wholesale/Manufacture/Other/Government; Cluster (6,7) - Public/ Construction.

(iv) Character of new clusters:

Cluster (1,2,3,4,5) - 74 cases. This cluster exhibits considerable internal variation, but is essentially retail oriented ($\bar{x}$ = 40.0 per cent), with some orientation of sales to the wholesale, manufacturing, 'other' and government sectors.

Cluster (6,7) - 46 cases. The market orientation of this subset of firms is quite definitive, with mean sales of 54.4 per cent direct to the public and 37.0 per cent to construction firms. Sales to the remaining sectors, for which there is minimal intra-cluster variation, are well below average.

(v) Cluster diagnostics (Refer Appendix 5.1 for definition of F-Ratio and T-Value):

Cluster (1,2,3,4,5)			74 Cases	Launceston only manufacturers			Cluster (6,7)			46 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
1.4676	0.2219	9.97	19.28	Manufacture	6.44	15.92	0.0525	-0.3569	0.76	3.65
0.1973	-0.4208	6.08	12.50	Construction	17.92	28.14	1.5647	0.6770	36.98	35.20
1.4778	0.1986	13.72	27.19	Wholesale	9.28	22.36	0.0780	-0.3195	2.13	6.25
1.1407	0.4281	40.04	37.21	Retail	25.12	34.84	0.0080	-0.6886	1.13	3.11
1.4327	0.1149	7.86	16.13	Government	6.32	13.48	0.2636	-0.1848	3.83	6.92
0.2195	-0.4905	11.19	15.83	Public	27.76	33.78	1.2560	0.7891	54.41	37.86
1.4649	0.2286	11.14	21.05	Other	7.16	17.40	0.0439	-0.3678	0.76	3.65

Source: Launceston manufacturing survey, 1980.

LEVEL 3

(i) Fusion coefficient : 32.2

(ii) No. of clusters : 3

(iii) Cluster identification : Cluster (1) - Wholesale; Cluster (2,3,4,5) - Retail and Manufacture/Other/Government; Cluster (6,7).

(iv) Character of new clusters:

Cluster (1) - 13 cases. This cluster isolates those firms closely linked to the wholesale sector ($\bar{x}$ = 68.2 per cent), with minor proportions to the retail, public and government purchasing sectors totalling 26.2 per cent on average.

Cluster (2,3,4,5) - 61 cases. The retail orientation of the higher order cluster is retained in this sub-group of firms containing the residual orientations at this level. Sales to retailers average 46.4 per cent, together with above average sales to the manufacturing, other and government sectors. Mean sales direct to the public are also relatively large (11.9 per cent), although they are well below average for the population of Launceston only firms overall.

(v) Cluster diagnostics:

Cluster (1)			13 Cases	Launceston only manufacturers			Cluster (2,3,4,5)			61 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
0.0536	-0.2742	2.08	3.68	Manufacture	6.44	15.92	1.7102	0.3276	11.66	20.82
0.0611	-0.5412	2.69	6.96	Construction	17.92	28.14	0.2240	-0.3952	6.80	13.32
0.8779	2.6363	68.23	20.95	Wholesale	9.28	22.36	0.0604	-0.3209	2.10	5.50
0.2628	-0.4275	10.23	17.86	Retail	25.12	34.84	1.1429	0.6104	46.39	37.25
0.7446	0.1192	7.92	11.63	Government	6.32	13.48	1.5942	0.1140	7.85	17.02
0.0997	-0.5827	8.08	10.67	Public	27.76	33.78	0.2449	-0.4709	11.85	16.72
0.0254	-0.3673	0.77	2.77	Other	7.16	17.40	1.6838	0.3556	13.34	22.57

Source: Launceston manufacturing survey, 1980.

LEVEL 4

(i) Fusion coefficient : 31.0

(ii) No. of clusters : 4

(iii) Cluster identification : Cluster (1); Cluster (2) - Retail; Cluster (3,4,5) - Manufacture/Other/Government; Cluster (6,7).

(iv) Character of new clusters:

Cluster (2) - 35 cases. These firms represent a predominantly retail oriented sub-group for which there is minimal variation within the cluster. Mean sales to retailers are 72.0 per cent, with the bulk of the remaining sales ($\bar{x}$ = 13.0 per cent) direct to the public.

Cluster (3,4,5) - 26 cases. The more varied sales pattern of these firms is dominated by above average sales to manufacturers ($\bar{x}$ = 24.9 per cent), 'other' industrial sectors ($\bar{x}$ = 26.9 per cent) and the government sector ($\bar{x}$ = 13.8 per cent). Again, sales to the public are relatively substantial ($\bar{x}$ = 10.3 per cent), yet they are not important in definition of the cluster.

(v) Cluster diagnostics:

Cluster (2)			35 Cases	Launceston only manufacturers			Cluster (3,4,5)			26 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
0.0854	-0.2916	1.80	4.65	Manufacture	6.44	15.92	2.7289	1.1611	24.92	26.29
0.1602	-0.4775	4.49	11.27	Construction	17.92	28.14	0.2974	-0.2843	9.92	15.35
0.0529	-0.3279	1.94	5.14	Wholesale	9.28	22.36	0.0729	-0.3116	2.31	6.04
0.5331	1.3453	72.00	25.44	Retail	25.12	34.84	0.2439	-0.3789	11.92	17.21
0.2158	-0.2122	3.46	6.26	Government	6.32	13.48	3.1833	0.5530	13.77	24.05
0.2792	-0.4361	13.03	17.85	Public	27.76	33.78	0.2042	-0.5178	10.27	15.26
0.2330	-0.2226	3.29	8.40	Other	7.16	17.40	2.6262	1.1340	26.88	28.19

Source: Launceston manufacturing survey, 1980.

LEVEL 5

(i) Fusion coefficient : 24.6

(ii) No. of clusters : 5

(iii) Cluster identification : Cluster (1); Cluster (2); Cluster (3,4,5); Cluster 6 - Public; Cluster (7) - Construction.

(iv) Character of new clusters:

Cluster (6) - 23 cases. Sales from cluster 6 firms are almost entirely direct to the public ($\bar{x}$ = 88.9 per cent). This is the most clearly defined of all the subsets.

Cluster (7) - 23 cases. This cluster represents the sub-group of Launceston only manufacturers providing direct support to the construction industry ($\bar{x}$ = 69.1 per cent), although a substantial proportion of sales are still directed to the public ($\bar{x}$ = 20.0 per cent).

(v) Cluster diagnostics:

Cluster (6)			23 Cases	Launceston only manufacturers			Cluster (7)			23 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
-0.0000	-0.4047	0.00	0.00	Manufacture	6.44	15.92	0.1026	-0.3091	1.52	5.10
0.0998	-0.4654	4.83	8.89	Construction	17.92	28.14	0.3720	1.8194	69.13	17.17
0.0456	-0.3409	1.65	4.77	Wholesale	9.28	22.36	0.1130	-0.2981	2.61	7.52
0.0119	-0.6687	1.83	3.80	Retail	25.12	34.84	0.0036	-0.7086	0.43	2.09
0.2105	-0.2590	2.83	6.18	Government	6.32	13.48	0.3172	-0.1106	4.83	7.59
0.1534	1.8092	88.87	13.23	Public	27.76	33.78	0.2400	-0.2310	19.96	16.55
0.0000	-0.4115	0.00	0.00	Other	7.16	17.40	0.0859	-0.3240	1.52	5.10

Source: Launceston manufacturing survey, 1980.

LEVEL 6

(i) Fusion coefficient : 21.2

(ii) No. of clusters : 6

(iii) Cluster identification : Cluster (1); Cluster (2); Cluster (3) - Manufacture; Cluster (4,5) - Other/Government; Cluster (6); Cluster(7).

(iv) Character of new clusters:

Cluster (3) - 9 cases. Sales to manufacturers average 53.7 per cent for this subset of firms, with substantial components of the remaining sales being directed to construction firms ($\bar{x}$ = 18.3 per cent) and retailers ($\bar{x}$ = 15.6 per cent).

Cluster (4,5) - 17 cases. This subset displays quite a varied pattern of inter-sector sales orientation, considerably above average to the 'other' sector ($\bar{x}$ = 41.1 per cent), together with considerable orientation to the government sector ($\bar{x}$ = 18.7 per cent). There is, nonetheless, marked variation in sales to each of these principal sectors amongst firms within the cluster. Interactions with the public ($\bar{x}$ = 13.5 per cent), retailers ($\bar{x}$ = 10.0 per cent) and manufacturers ($\bar{x}$ = 9.7 per cent) are also important to these firms.

(v) Cluster diagnostics:

Cluster (3)			9 Cases	Launceston only manufacturers			Cluster (4,5)			17 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
0.7095	2.9670	53.67	13.41	Manufacture	6.44	15.92	1.1036	0.2051	9.71	16.72
0.5208	0.0145	18.33	20.31	Construction	17.92	28.14	0.1275	-0.4425	5.47	10.05
0.1222	-0.2409	3.89	7.82	Wholesale	9.28	22.36	0.0485	-0.3490	1.47	4.93
0.2957	-0.2746	15.56	18.95	Retail	25.12	34.84	0.2239	-0.4341	10.00	16.49
0.1529	-0.1389	4.44	5.27	Government	6.32	13.48	4.4856	0.9193	18.71	28.54
0.0194	-0.7001	4.11	4.70	Public	27.76	33.78	0.2808	-0.4213	13.53	17.90
0.0000	-0.4115	0.00	0.00	Other	7.16	17.40	2.0487	1.9521	41.12	24.90

Source: Launceston manufacturing survey, 1980

LEVEL 7

(i) Fusion coefficient : 5.6

(ii) No. of clusters : 7

(iii) Cluster identification : Cluster (1); Cluster (2); Cluster (3); Cluster (4) - Other; Cluster (5) - Government; Cluster (6); Cluster (7).

(iv) Character of new clusters:

Cluster (4) - 13 cases. This subset of firms exhibits the most variation of the seven discrete clusters. Inter-sector interaction is greatest with the 'other' market sectors, principally transport, mining and entertainment industries ($\bar{x}$ = 50.7 per cent), yet considerable sales are made to manufacturers ($\bar{x}$ = 12.7 per cent), the public ($\bar{x}$ = 13.6 per cent) and retailers ($\bar{x}$ = 10.8 per cent).

Cluster (5) - 4 cases. The four firms constituting Cluster 5 sell most of their output to government agencies ($\bar{x}$ = 62.5 per cent), with supplementary sales direct to the public ($\bar{x}$ = 13.3 per cent) and/or to the 'other' industrial sectors ($\bar{x}$ = 10.0 per cent).

(v) Cluster diagnostics:

Cluster (4)			13 Cases	Launceston only manufacturers			Cluster (5)			4 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
1.3094	0.3927	12.69	18.21	Manufacture	6.44	15.92	0.0000	-0.4047	0.00	0.00
0.1585	-0.4018	6.62	11.21	Construction	17.92	28.14	0.0155	-0.5747	1.75	3.50
0.0038	-0.3976	0.38	1.39	Wholesale	9.28	22.36	0.2000	-0.1912	5.00	10.00
0.2500	-0.4120	10.77	17.42	Retail	25.12	34.84	0.1853	-0.5058	7.50	15.00
0.4259	-0.0806	5.23	8.80	Government	6.32	13.48	3.8081	4.1688	62.50	26.30
0.2424	-0.4187	13.62	16.63	Public	27.76	33.78	0.5279	-0.4295	13.25	24.54
1.0064	2.5025	50.69	17.45	Other	7.16	17.40	1.3218	0.1634	10.00	20.00

Source: Launceston manufacturing survey, 1980

A6.2 Structure of the classification of the market sector linkages of multi-locational manufacturers.

In the classification of multi-locational firms to identify distinctive subsets based on market-sector orientation, the largest break in the fusion coefficient values occurs at the fusion coefficient of 2.229 (Figure A6.2).

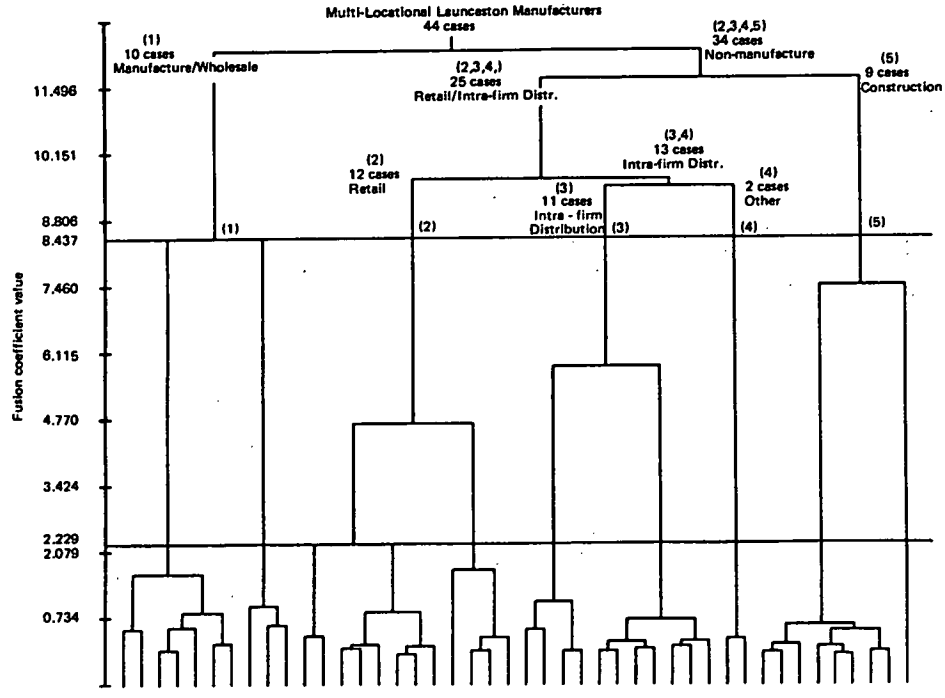


Figure A6.2: Dendrogram of market sector linkages, multi-locational Launceston manufacturers.

This fusion results in nine clusters, but the majority of these represent intricate permutations of the sales orientation of higher order clusters, without effective discrimination. Thus, a cut-off further up the classification to identify the essential character of the inter-sector orientation, and at the same time to remove the internal intricacies, is

necessary. This occurs at the fusion coefficient of 8.437, resulting in the identification of five reasonably discrete forms of sales orientation. The structure of the classification is as follows:

LEVEL 1

(i) Fusion coefficient : 12.2

(ii) No. of clusters : 1

(iii) Cluster identification : (1,2,3,4,5) - 44 cases. All multi-locational Launceston manufacturers.

LEVEL 2

(i) Fusion coefficient : 11.7

(ii) No. of clusters : 2

(iii) Cluster identification: Cluster (1) - Manufacture/wholesale; Cluster (2,3,4,5) - Non-manufacture.

(iv) Character of new clusters:

Cluster (1) - 10 cases. A manufacturing orientation dominates this, the smaller of the two clusters at this level. Sales to independent manufacturers ($\bar{x}$ = 38.2 per cent) and to branches or subsidiaries for further manufacture ($\bar{x}$ = 4.1 per cent) are well above average. In fact, intra-organisational manufacturing integration is entirely restricted to this cluster. Nonetheless, sales orientation for the cluster is not completely manufacturing as sales to wholesalers constitute a substantial component of the output from this sub-group of firms ($\bar{x}$ = 30.8 per cent).

The sub-division of Cluster 1 immediately below the cut-off for this classification does not discriminate discrete manufacture and wholesale oriented clusters.

Cluster (2,3,4,5) - 34 cases. This cluster presents a complex pattern of inter-sector sales linkages which, in aggregate, is distinctive because of its non-manufacturing orientation. Sales are directed to all of the non-manufacturing sectors, but in particular to retailers ($\bar{x}$ = 25.8 per cent), construction firms ($\bar{x}$ = 20.4 per cent) and to branches or subsidiaries for distribution ($\bar{x}$ = 18.9 per cent).

(v) Cluster diagnostics:

Cluster (1)			10 Cases	Multi-locational Launceston manufacturers			Cluster (2,3,4,5)			34 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
3.4483	0.9616	4.10	6.12	I.F. Manufacture	0.93	3.29	0.0000	-0.2828	0.00	0.00
0.1427	-0.4339	5.30	9.12	I.F. Distribution	15.77	24.14	1.1903	0.1276	18.85	26.33
1.6118	1.4135	38.20	24.63	Manufacture	10.77	19.40	0.0799	-0.4157	2.71	5.49
0.2485	-0.3164	8.50	14.54	Construction	17.73	29.17	1.1960	0.0930	20.44	31.90
0.8722	0.7539	30.80	19.71	Wholesale	14.89	21.11	0.8422	-0.2217	10.21	19.37
0.1135	-0.5468	4.50	10.12	Retail	20.93	30.05	1.1548	0.1608	25.76	32.29
0.3647	-0.1823	5.30	6.31	Government	7.20	10.44	1.1905	0.0536	7.76	11.40
0.0381	-0.2948	2.10	3.21	Public	6.95	16.47	1.2586	0.0867	8.38	18.48
0.0596	-0.2328	1.20	3.79	Other	4.82	15.54	1.2655	0.0685	5.88	17.48

I.F. = Intra-firm.

Source: Launceston manufacturing survey, 1980

LEVEL 3

(i) Fusion coefficient : 9.6

(ii) No. of clusters : 3

(iii) Cluster identification : Cluster (1); Cluster (2,3,4) - Retail/ Intra-firm distribution; Cluster (5) - Construction.

(iv) Character of new clusters:

Cluster (2,3,4) - 25 cases. Cluster (2,3,4) represents the residual non-manufacturing orientation at this level. It contains 25 firms directing their sales predominantly towards the retail sector ($\bar{x}$ = 34.7 per cent) and to branches or subsidiaries for distribution ($\bar{x}$ = 24.4 per cent), with supplementary sales to the wholesale ($\bar{x}$ = 12.5 per cent), government ($\bar{x}$ = 8.6 per cent) and 'other' ($\bar{x}$ = 8.0 per cent) sectors.

Cluster (5) - 9 cases. Sales to the construction industry average 66.7 per cent for these firms, and as for Launceston only operations, there is an important secondary orientation direct to the public ($\bar{x}$ = 18.7 per cent).

(v) Cluster diagnostics:

Cluster (2,3,4)			25 Cases	Multi-locational Launceston manufacturers			Cluster (5)			9 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
-0.0000	-0.2828	0.00	0.00	I.F. Manufacture	0.93	3.29	-0.0000	-0.2829	0.00	0.00
1.3971	0.3591	24.44	28.53	I.F. Distribution	15.77	24.14	0.0858	-0.5154	3.33	7.07
0.0966	-0.3861	3.28	6.03	Manufacture	10.77	19.40	0.0295	-0.4979	1.11	3.33
0.0672	-0.4775	3.80	7.56	Construction	17.73	29.17	0.8890	1.6779	66.67	27.50
1.0667	-0.1140	12.48	21.80	Wholesale	14.89	21.11	0.1372	-0.5210	3.89	7.82
1.2358	0.4588	34.72	33.41	Retail	20.93	30.05	0.0079	-0.6670	0.89	2.67
1.4758	0.1336	8.60	12.69	Government	7.20	10.44	0.4081	-0.1685	5.44	6.67
0.3526	-0.1381	4.68	9.78	Public	6.95	16.47	3.5373	0.7111	18.67	30.98
1.6670	0.2047	8.00	20.06	Other	4.82	15.54	-0.0000	-0.3100	0.00	0.00

I.F. = Intra-firm.

Source: Launceston manufacturing survey, 1980.

LEVEL 4

(i) Fusion coefficient : 9.5

(ii) No. of clusters : 4

(iii) Cluster identification : Cluster (1); Cluster (2) - Retail; Cluster (3,4) - Intra-firm distribution; Cluster (5).

(iv) Character of new clusters:

Cluster (2) - 12 cases. Sales to retailers dominate Cluster 2, averaging 59.8 per cent, supplemented by a secondary orientation to wholesalers ($\bar{x}$ = 17.8 per cent).

Cluster (3,4) - 13 cases. These firms are characterised by intra-organisational sales destined for further distribution ($\bar{x}$ = 42.5 per cent), together with marginal orientation to government ($\bar{x}$ = 14.6 per cent) and 'other' ($\bar{x}$ = 10.7 per cent) sectors. Retail sales ($\bar{x}$ = 11.5 per cent) are also relatively large, but below average.

(v) Cluster diagnostics:

Cluster (2)			12 Cases	Multi-locational Launceston manufacturers			Cluster (3,4)			13 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
-0.0000	-0.2828	0.00	0.00	I.F. Manufacture	0.93	3.29	-0.0000	-0.2828	0.00	0.00
0.1319	-0.4498	4.92	8.76	I.F. Distribution	15.77	24.14	1.4150	1.1058	42.46	28.71
0.0108	-0.5251	0.58	2.02	Manufacture	10.77	19.40	0.1461	-0.2579	5.77	7.42
0.0879	-0.5078	2.92	8.65	Construction	17.73	29.17	0.0520	-0.4495	4.62	6.65
1.9658	0.1357	17.75	29.59	Wholesale	14.89	21.11	0.2116	-0.3445	7.62	9.71
0.9849	1.2945	59.83	29.82	Retail	20.93	30.05	0.2258	-0.3126	11.54	14.28
0.1441	-0.4903	2.08	3.96	Government	7.20	10.44	2.0709	0.7095	14.62	15.03
0.6682	-0.0074	6.83	13.46	Public	6.95	16.47	0.0598	-0.2588	2.69	4.03
0.4031	0.0171	5.08	9.87	Other	4.82	15.54	2.8967	0.3780	10.69	26.45

I.F. = Intra-firm.

Source: Launceston manufacturing survey, 1980.

LEVEL 5

(i) Fusion coefficient : 8.4

(ii) No. of clusters : 5

(iii) Cluster identification : Cluster (1); Cluster (2); Cluster (3) - Intra-firm distribution; Cluster (4) - 'Other' sectors; Cluster 5.

(iv) Character of new clusters:

Cluster (3) - 11 cases. This subset of firms is distinguished on the basis of a considerable transfer of goods within the organisation for further distribution ($\bar{x}$ = 50.2 per cent). This is complemented by an above average component ($\bar{x}$ = 13.6 per cent) direct to government agencies, together with other supplementary sales to retailers ($\bar{x}$ = 13.6 per cent) and wholesalers ($\bar{x}$ = 9.0 per cent).

Cluster (4) - 2 cases. This is a specialised cluster of only two firms for which sales, considered as supplementary at higher levels within the classification, emerge to identify a discrete orientation to 'other' purchasing sectors ($\bar{x}$ = 69.5 per cent), with above average sales to the government sector ($\bar{x}$ = 20.0 per cent).

(v) Cluster diagnostics:

Cluster (3)			11 Cases	Multi-locational Launceston manufacturers			Cluster (4)			2 Cases
F-Ratio	T-Value	Mean	Std. Dev.	Variable	Mean	Std. Dev.	F-Ratio	T-Value	Mean	Std. Dev.
-0.0000	-0.2828	0.00	0.00	I.F. Manufacture	0.93	3.29	0.0000	-0.2828	0.00	0.00
0.9665	1.4257	50.18	23.73	I.F. Distribution	15.77	24.14	0.0000	-0.6535	0.00	0.00
0.1110	-0.2975	5.00	6.47	Manufacture	10.77	19.40	0.5312	-0.0398	10.00	14.14
0.0565	-0.4208	5.45	6.93	Construction	17.73	29.17	0.0000	-0.6078	0.00	0.00
0.2231	-0.2789	9.00	9.97	Wholesale	14.89	21.11	-0.0000	-0.7052	0.00	0.00
0.2361	-0.2428	13.64	14.60	Retail	20.93	30.05	-0.0000	-0.6965	0.00	0.00
2.4222	0.6158	13.64	16.26	Government	7.20	10.44	0.0000	1.2250	20.00	0.00
0.0674	-0.2346	3.09	4.28	Public	6.95	16.47	0.0018	-0.3919	0.50	0.71
-0.0000	-0.3100	0.00	0.00	Other	4.82	15.54	0.9130	4.1622	69.50	14.85

I.F. = Intra-firm.

Source: Launceston manufacturing survey, 1980.

APPENDIX 7

STATISTICAL TECHNIQUES MEASURING THE STRENGTH AND SIGNIFICANCE OF RELATIONSHIPS

A7.1 Chi-square test for independent samples.

The objective of the analyses for which the chi-square test is adopted within the study is to determine the significance of the difference between (or the independence of) two distributions.[3] Its choice is determined by the fact that it is the appropriate nonparametric alternative when measures for the variables in the relationship being tested are sub-divided into discrete categories which may be in the form of nominal scaling.

The data consist of frequencies in the discrete categories, and the hypothesis under test is that:

> ...the two groups differ with respect to some character [the independent variable] and therefore the relative frequencies with which group members fall in several categories [of the dependent variable] (Siegel, 1956, 104).

Thus, the essential basis of the test is a comparison of the relative incidence of cases from the two samples (sub-populations) in each of the categories of the dependent variable.

When such analyses within the study involve more than two categories of the dependent variable, the computation of the chi-square statistic is

---

3 This and all other statistical techniques measuring the strength and significance of relationships for the purposes of this study were run on a DEC PDP-11 computer system at the Tasmanian College of Advanced Education using the Statistical Package for the Social Sciences. The key technical references are Nie *et al.* (1975), Morrison (1982) and Norusis and Wang (1983). Further details of the range of techniques adopted and the rationale for their use are available in Siegel (1956), Gregory (1968), Hays (1973), Andrews *et al.* (1974), Hammond and McCullagh (1974), Yeats (1974), Roscoe (1975) and Clover and Balsley (1979).

according to the formula:

$$x^2 = \sum_{i=1}^{r} \sum_{j=1}^{k} \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

O_{ij} is the observed frequency in the cell in row i, column j.

E_{ij} is the expected frequency in the cell in row i, column j.

$\sum_{i=1}^{r} \sum_{j=1}^{k}$ indicates the sum over all cells in r rows and k columns.

The higher the value of x^2 the greater is the likelihood that the two distributions differ. Acceptance of the hypothesis at the desired level of significance is determined by comparing the value of x^2 with the chi-square distribution for various degrees of freedom. Degrees of freedom depend on the number of categories of the dependent (cross-classification rows) and the independent (cross-classification columns) variables. The degrees of freedom for any such contingency table is given by the formula:

$$df = (r - 1)(k - 1)$$

r is the number of categories of the dependent variable (rows)

k is the number of categories of the independent variable (columns).

Limitations on the applicability of the x^2 statistic in the case of the two independent samples with df > 1 (that is, three or more categories of the dependent variable), are that no more than 20 per cent of all cells

have an expected frequency of less than five, and no cell has an expected frequency less than one. Where these conditions are not met, categories are combined or alternatives adopted to ensure proper application of the test, and these are indicated within the text.

For the analyses in the study that are in the form of 2 x 2 contingency tables: that is, two categories of the dependent variable and df = 1, the number of cases involved is 27. Fisher's exact test is invoked since expected frequencies of less than five are encountered. In this case:

> ...the exact one tailed probability of the observed or more extreme configuration under the assumption of independence of rows and columns and conditioned on the marginal totals is calculated (Norusis and Wang, 1983, 185).

The probability of observing a particular set of frequencies is:

$$p(A,B,C,D) = \frac{(A + B)!\ \ (C + D)!\ \ (A + C)!\ \ (B + D)!}{N!\ A!\ B!\ C!\ D!}$$

when the configuration is:

A	B	(A + B)
C	D	(C + D)
(A + C)	(B + D)	N

The procedure also determines the probability of even more extreme variations with the same marginal total, and the probabilities so calculated and that calculated for the observed distribution, are summed to determine the significance of the relationship. Since the research hypotheses under investigation in these particular analyses imply the direction of the difference, the one-tailed region of rejection is invoked.

A7.2 Kruskal-Wallis one-way analysis of variance by ranks.

For the majority of the analyses to establish the strength and significance of relationships within this study, the independent variable is sub-divided into more than two categories. That is, variation across 'k' independent samples is being assessed to determine the significance of the difference between three or more independent groups. In each case, the specific purpose is to examine variations in regional linkage patterns across discrete categories of a range of attributes of firm character. Thus, for each attribute analysis for each linkage form there are two variables:

(i) The regional distribution of sales or purchases in the form of continuous data (percentage values) as the dependent variable; and

(ii) the attribute of firm character in the form of discrete or grouped data as the independent variable. For some of the attributes (for example, employment size) categorisation involves absolute ranking, in others (for example, operational technology) an implicit continuum, and in others (for example, industrial classification) merely a means of identification. As a result, firm attribute information is collectively regarded as nominal data.

The F-test, the parametric alternative of one-way analysis of variance, was rejected for this study since the conditions of normality of distribution and homogeneity of variance for the populations under investigation could not be guaranteed. Accordingly, a nonparametric alternative to one-way analysis of variance is adopted. The technique chosen is the Kruskal-Wallis test, a one-way analysis of variance using

ranks which is 'almost as powerful as the F-test in the analysis of variance under common research conditions' (Roscoe 1975, 304). The only assumptions of this test, that the dependent variable under investigation is continuously distributed and that it is measured on at least the ordinal scale, are met by the data used in the study.

For the purpose of this study, the technique tests the null hypothesis that the linkage patterns of the sub-populations defined by the separate categories of the particular attributes of firm character are identical (from identical populations when sample data are used) with respect to averages. The process involves ranking all scores from all sub-populations in a single series, and the sum of the ranks in each sub-population (column) is computed. The test determines whether these sums of ranks are so different as to reflect real differences among the independent groups, and thus rejection of the null hypothesis (Siegel, 1956, 185).

The statistic used in the Kruskal-Wallis test is the H-statistic, computed according to the following formula:

$$H = \frac{12}{N(N+1)} \sum_{j=1}^{k} \frac{R_j^2}{n_j} - 3(N+1)$$

k is the number of sub-populations (the number of categories of the independent variable).

n_j is the number of observations in the j th sub-population.

N is the total number of observations (that is, $\sum n_j$).

R_j is the sum of the ranks in the j th sub-population.

$\sum_{j=1}^{k}$ indicates the sum over all sub-populations.

Rejection of the null hypothesis at the desired level of significance is determined by comparing the value of the H-statistic with the chi-square distribution for various degrees of freedom, defined as df = k - 1.

The modifications required for very small sub-populations are unnecessary in this study. The situation of a high proportion of tied ranks (for which each score is allotted the mean of the ranks) is encountered, however. Thus, a tie correction factor is used in which the value of the H-statistic is divided by:

$$1 - \frac{\sum_{j=1}^{m} T_j}{N3 - N}$$

$T_j = t_j^3 - t_j$

t_j is the number of tied observations in the j th sub-population.

$\sum_{j=1}^{m} T_j$ indicates the sum over all (m) groups of ties.

N is as defined above.

APPENDIX 8

WEIGHTED SALES LINKAGES OF LAUNCESTON MANUFACTURERS

The analyses of sales linkages and market sector orientation of Launceston manufacturers (Chapter 4) were undertaken using proportional data because of the inability to obtain data in absolute monetary values (Refer Section 1.3). Thus, the analyses proceeded on the basis of all firms, irrespective of size, contributing equally to linkage patterns. However, there is variation in the relative strength of the linkage patterns of firms of different size, and thus variation in their economic impact on the local economy. In order to provide this perspective to the results of Chapter 4, surrogate measures of an absolute base are adopted by weighting the proportional data (the percentage of the total value of sales by region or by purchasing sector) on the basis of unemployment size, annual turnover and replacement value of capital invested in plant and machinery.

On this basis, there is a much stronger non-Tasmanian orientation within the aggregated regional distribution of sales from the Launceston manufacturing economy (Table A8.1). Regional sales weighted by employment result in mean sales of 45.1 per cent to markets outside the state compared with the unweighted figure of 10.6 per cent, with most of this differential being accounted for by a corresponding reduction in the magnitude of sales to Launceston rather than uniformly across the entire Tasmanian market. This clearly reflects the relationship established between the very localised sales of small firms and the more extended linkage patterns of larger firms.

Because of some non-response, the number of firms is reduced when data are weighted by turnover and capital investment. However, a similar,

Table A8.1: Aggregated sales linkages of Launceston manufacturers, unweighted and weighted.

Region	Unweighted Mean[1]	Mean[1] weighted by: Employment	Turnover	Capital investment	Capital investment employment
Launceston	56.30	25.38	29.95	32.38	51.25
Rest of N. and N.E. Tasmania	8.69	5.76	6.86	7.44	8.52
N.W. and W. Tasmania	10.91	9.98	15.80	16.66	13.93
Southern Tasmania	12.32	7.44	11.67	12.99	17.39
Tasmania unspecified	1.14	6.37	0.93	1.52	0.48
SUB-TOTAL: Tasmania	89.36	54.93	65.21	70.99	91.57
Victoria	5.18	14.13	11.92	9.10	4.43
N.S.W./A.C.T.	1.54	7.66	5.19	3.02	1.22
W.A./S.A.	0.69	2.99	1.85	0.83	0.33
QLD./N.T.	0.56	1.68	1.11	0.50	0.32
Mainland unspecified	1.22	10.81	6.34	6.87	0.58
Overseas	1.45	7.81	8.38	8.68	1.54
SUB-TOTAL: Outside Tasmania	10.64	45.08	34.79	29.00	8.42
TOTAL	100	100	100	100	100
No. of firms	172[2]	172[2]	160[3]	156[4]	156[4]

[1] The mean of the percentage of total value of sales to the regions.

[2] No response to distribution of sales from three firms.

[3] No response to turnover from a further twelve firms.

[4] No response to capital investment from a further sixteen firms.

Source: Launceston manufacturing survey, 1980.

though weaker, reversal in the relativities is evident. This reflects a slight tendency towards greater labour intensity rather than capital intensity among the larger export earners, and that growth in employment size is not entirely commensurate with growth in turnover.[4] Indeed, weighting in terms of capital investment/labour intensity relationships merely nullifies a magnitude rating of regional sales (Table A8.1, final column). The implications, therefore, are that there is very little manufacturing activity in Launceston that has a very high capital intensity, and/or simply that higher capital investment generally involves a correspondingly higher employment size. This is marginally reversed for the Tasmanian regional (non-Launceston) markets, however. These relationships concur with the fact that no export earners operate continuous, standardised, mass-production processes.

This change in relativities within the spatial interaction field of Launceston manufacturers in terms of magnitude of sales suggests a greater involvement in manufacture to intermediate demand, and a demonstrably greater impact of the export oriented firms for the local manufacturing economy, than indicated by the number of firms involved. Sales to manufacturers (within the firm and to independent manufacturers) and sales to wholesalers, the sectors identified as the principal intermediate demand purchasers, increase from 7.9 and 10.8 per cent of sales (unweighted) to 17.7 and 22.0 per cent (weighted by employment) respectively (Table A8.2). This modification to the level of production to intermediate demand

---

4 Nonetheless, responses to turnover and replacement value of capital invested in plant and machinery are categorised, and the category ranges are broad at the higher levels. This may have clouded these relationships.

reflects a greater involvement of the larger firms in processing activities and/or the production of semi-manufactured goods using natural resources, together with the large 'filtered down' manufacturers. The link between intermediate demand and non-Tasmanian markets is not affected, however.

Table A8.2: Market sector linkages of Launceston manufacturers, unweighted and weighted.

Market Sector	Unweighted Mean[1]	Mean[1] weighted by:		
		Employment	Turnover	Capital Invested
Branches/subsidiaries - for manufacture	0.25	1.17	1.75	1.02
Branches/subsidiaries - for distribution	4.23	6.01	12.68	16.21
Manufacturers	7.60	16.48	12.81	13.29
Construction firms	17.87	9.98	11.48	10.06
Wholesalers	10.78	22.04	21.11	20.50
Retailers	24.00	29.51	26.18	23.27
Government	6.56	3.64	5.70	5.56
Public	22.18	4.47	4.25	4.83
Other	6.53	6.71	4.05	5.27
TOTAL	100	100	100	100
No. of firms	164[2]	164[2]	153[3]	149[4]

1. The mean of the percentage of total value of sales to market sectors.
2. No response to distribution of sales by market sector from 11 firms.
3. No response to turnover from a further 11 firms.
4. No response to capital investment from a further 15 firms.

Source: Launceston manufacturing survey, 1980.

When the elements of the sales linkage structure of the Launceston manufacturing economy are considered in relation to weighted sales data,

the relatively few externally oriented firms (N = 23) emerge as contributing approximately 50 per cent of the total value of sales linkages, slightly more than one half in terms of employment generation and slightly less than one half in terms of revenue generation, of which non-locally based firms are responsible for almost two thirds (Table A8.3).

Table A8.3: Sales linkage structure of the Launceston manufacturing economy based on unweighted and weighted data.

Market Orientation	Unweighted data		Data weighted by:		
	No. of firms[1]	% of firms	Employment (%)[1]	Turnover (%)[2]	Capital Investment (%)[3]
Sales linkage subsets:					
Launceston and N.E. Tasmania	85	51.52	21.48	17.81	18.97
Tasmania wide	57	34.55	24.32	38.36	47.18
External	23	13.94	54.20	43.84	33.85
TOTAL	165[3]	100	100	100	100
Tasmania overall:					
Local firms	117	70.91	31.63	28.19	27.97
Non-local firms	25	15.15	14.16	27.97	38.18
External:					
Local firms	15	9.09	20.50	15.77	15.20
Non-local firms	8	4.85	33.71	28.06	18.65
TOTAL	165[3]	100	100	100	100

1. No response or insufficiently dissagregated responses to regional sales distribution from ten firms.
2. No response to turnover from a further 11 firms.
3. No response to capital investment from a further 15 firms.

Source: Launceston manufacturing survey, 1980.

Interestingly, investment in plant and machinery by Tasmania wide oriented firms is higher than suggested by the relativities evident via the alternative means of weighting, associated in particular with those non-locally based firms oriented to Tasmanian markets. This reflects the somewhat atypical practice of continuous producers operating entirely to markets within the state. Moreover, it suggests that the financial resources necessary for the initially high capital investment required by this mode of operation, and perhaps initiative and the technological and logistical expertise, are less readily available within the local environment.

Thus, the conclusions of Chapter 4, whilst reflecting the type of manufacturing operation associated with distinctive linkage patterns, and the relative importance of these types of firms, must not be directly interpreted in terms of regional economic impact.

APPENDIX 9

CLASSIFICATION OF INPUT LINKAGES

A9.1 Structure of the classification of the input linkages of Launceston manufacturers.

The structure of the classification of regional purchase patterns using agglomerative cluster analysis, procedure Hierarchy (Refer Appendix 5.1), contains a substantial discontinuity in fusion coefficient values between the fusion to eight clusters at a value of 21.402, and to nine clusters at a value of 7.080 (Figure A9.1). On this basis the limit to the classification structure is established at the fusion coefficient of 7.1, resulting in nine discrete source areas to which subsets of Launceston firms are predominantly oriented in the procurement of their inputs.

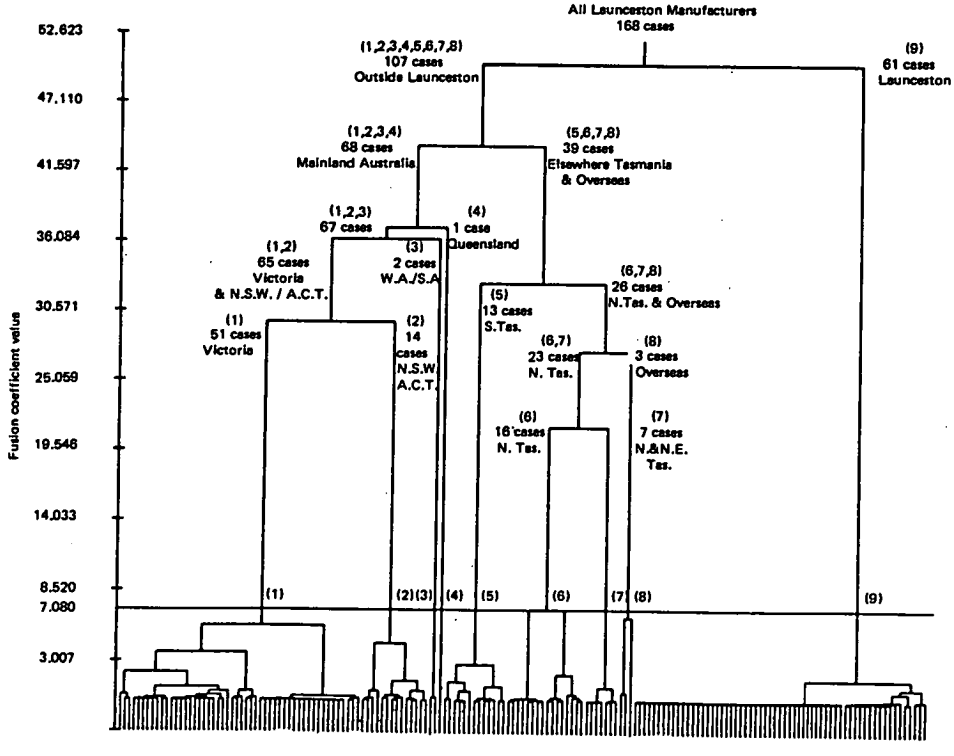


Figure A9.1: Dendrogram of regional input linkages, Launceston manufacturers.

The structure of the classification is as follows:

LEVEL 1

(i) Fusion coefficient: 50.1

(ii) No. of clusters : 1

(iii) Cluster identification: (1,2,3,4,5,6,7,8,9) - 168 cases. All firms.

LEVEL 2

(i) Fusion coefficient: 43.6

(ii) No. of clusters : 2

(iii) Cluster identification: Cluster (1,2,3,4,5,6,7,8) - Outside Launceston; Cluster (9) - Launceston.

(iv) Character of new clusters:

Cluster (1,2,3,4,5,6,7,8) - 107 cases. These firms are characterised by above average purchases from all regional source areas except Launceston, although there does remain a reasonably large (residual) component of purchases from this source ($\bar{x}$ = 19.8 per cent).

Cluster (9) - 61 cases. Cluster 9 represents the subset of Launceston operations almost entirely dependent on sources located within the centre of manufacturing ($\bar{x}$ = 92.5 per cent).

(v) Cluster diagnostics (Refer Appendix 5.1 for definition of F-Ratio and T-Value):

Cluster (1,2,3,4,5,6,7,8) 107 cases				All firms			Cluster (9)			61 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.2287	-0.6813	19.79	18.55	Launceston	46.20	38.78	0.0997	1.1950	92.54	12.25
1.4605	0.1680	10.35	24.23	N & N.E.	6.98	20.05	0.0645	-0.2947	1.07	5.09
1.4318	0.1813	9.12	18.91	N.W. & W.	6.26	15.80	0.0923	-0.3181	1.23	4.80
1.4693	0.1870	9.03	20.09	S. Tasmania	5.93	16.58	0.0158	-0.3280	0.49	2.09
1.1139	0.3942	39.63	34.41	Victoria	26.77	32.61	0.0525	-0.6914	4.23	7.47
1.4878	0.1741	7.14	17.46	N.S.W./A.C.T.	4.65	14.31	0.0060	-0.3054	0.28	1.11
1.5543	0.0765	1.53	8.59	W.A./S.A.	1.01	6.89	0.0086	-0.1341	0.08	0.64
1.5701	0.0440	0.56	5.80	Qld./N.T.	0.36	4.63	-0.0000	-0.0772	0.00	0.00
1.5431	0.1079	2.73	11.40	Overseas	1.74	9.18	0.0000	-0.1892	0.00	0.00

Source: Launceston manufacturing survey, 1980.

LEVEL 3

(i) Fusion coefficient: 37.1

(ii) No. of clusters : 3

(iii) Cluster identification: Cluster (1,2,3,4) - Mainland Australia; Cluster (5,6,7,8) - Elsewhere Tasmania and Overseas; Cluster (9).

(iv) Character of new clusters:

Cluster (1,2,3,4) - 68 cases. This is the larger of the two new subsets which purchase the majority of their inputs from sources elsewhere in Australia ($\bar{x}$ = 73.6 per cent), principally Victoria ($\bar{x}$ = 58.3 per cent). Considerable intra-cluster variation exists for the remaining Australian regions indicating diversity within this aggregated orientation.

Cluster (5,6,7,8) - 39 cases. These firms are oriented primarily to Tasmanian sources outside Launceston ($\bar{x}$ = 70.1 per cent). However, there is the rather unexpected orientation associated with this cluster of above average purchases from overseas sources ($\bar{x}$ = 5.1 per cent), unusual to the extent that this most spatially separated source is linked to Tasmanian sources rather than the cluster identified by external sources. Thus, the cluster is identified as based on Tasmanian sources with a secondary overseas orientation.

(v) Cluster diagnostics:

Cluster (1,2,3,4)			68 cases	All firms			Cluster (5,6,7,8)			39 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.2547	-0.6363	21.53	19.57	Launceston	46.20	38.78	0.1790	-0.7597	16.74	16.41
0.0468	-0.3046	0.87	4.34	N. & N.E.	6.98	20.05	2.8948	0.9921	26.87	34.12
0.2115	-0.2535	2.25	7.27	N.W. & W.	6.26	15.80	2.6929	0.9395	21.10	25.93
0.0545	-0.2645	1.54	3.87	S. Tasmania	5.93	16.58	3.0019	0.9741	22.08	28.72
0.7935	0.9662	58.28	29.05	Victoria	26.77	32.61	0.1013	-0.6033	7.10	10.38
2.1467	0.4438	11.00	20.97	N.S.W./A.C.T.	4.65	14.31	0.0082	-0.2962	0.41	1.29
2.3902	0.1571	2.09	10.65	W.A./S.A.	1.01	6.89	0.0896	-0.0641	0.56	2.06
2.4706	0.1135	0.88	7.28	Qld./N.T.	0.36	4.63	-0.0000	-0.0772	0.00	0.00
0.2301	-0.0420	1.35	4.40	Overseas	1.74	9.18	3.7883	0.3693	5.13	17.87

Source: Launceston manufacturing survey, 1980.

LEVEL 4

(i) Fusion coefficient: 36.2

(ii) No. of clusters : 4

(iii) Cluster identification: Cluster (1,2,3) - Mainland Australia (southern states); Cluster (4) - Queensland; Cluster (5,6,7,8); Cluster (9).

(iv) Character of new clusters:

Cluster (1,2,3) - 67 cases. With the exclusion of a unique Queensland dependence, this cluster represents a southern states, mainland Australian, orientation. Above average purchases are made from Victoria ($\bar{x}$ = 58.7 per cent), New South Wales/Australian Capital Territory ($\bar{x}$ = 11.1 per cent) and Western Australia/South Australia ($\bar{x}$ = 2.1 per cent).

Cluster (4) - 1 case. This single firm cluster is distinctive because of a very heavy reliance on Queensland sources ($\bar{x}$ = 60.0 per cent), with supplementary support from Victorian sources ($\bar{x}$ = 29.0 per cent.)

(v) Cluster diagnostics:

Cluster (1,2,3)			67 Cases	All firms			Cluster (4)			1 case
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.2567	-0.6311	21.73	19.65	Launceston	46.20	38.78	0.0000	-0.9852	8.00	0.00
0.0477	-0.3040	0.88	4.37	N. & N.E.	6.98	20.05	0.0000	-0.3479	0.00	0.00
0.2144	-0.2514	2.28	7.32	N.W. & W.	6.26	15.80	0.0000	-0.3959	0.00	0.00
0.0552	-0.2631	1.57	3.89	S. Tasmania	5.93	16.58	0.0000	-0.3576	0.00	0.00
0.7931	0.9796	58.72	29.04	Victoria	26.77	32.61	0.0000	0.0683	29.00	0.00
2.1744	0.4521	11.12	21.10	N.S.W./A.C.T.	4.65	14.31	0.0000	-0.1152	3.00	0.00
2.4250	0.1616	2.12	10.73	W.A./S.A.	1.01	6.89	0.0000	-0.1460	0.00	0.00
-0.0000	-0.0772	0.00	0.00	Qld./N.T.	0.36	4.63	0.0000	12.8843	60.00	0.00
0.2333	-0.0398	1.37	4.43	Overseas	1.74	9.18	0.0000	-0.1893	0.00	0.00

Source: Launceston manufacturing survey, 1980.

LEVEL 5

(i) Fusion coefficient: 32.7

(ii) No. of clusters : 5

(iii) Cluster identification: Cluster (1,2) - Victoria and New South Wales/Australian Capital Territory; Cluster (3) - Western Australia/South Australia; Cluster (4); Cluster (5,6,7,8); Cluster (9).

(iv) Character of new clusters:

Cluster (1,2) - 65 cases. The majority of mainland Australian dependent firms are contained in Cluster (1,2), oriented to sources in Victoria particularly ($\bar{x}$ = 60.0 per cent) and New South Wales/Australian Capital Territory ($\bar{x}$ = 11.5 per cent).

Cluster (3) - 2 cases. The two Cluster 3 firms are characterised by substantial orientation to Western Australia/South Australia ($\bar{x}$ = 62.5 per cent). The orientation is to South Australia in fact.

(v) Cluster diagnostics:

Cluster (1,2)			65 cases	All firms			Cluster (3)			2 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.2600	-0.6297	21.78	19.77	Launceston	46.20	38.78	0.2993	-0.6757	20.00	21.21
0.0489	-0.3026	0.91	4.43	N. & N.E.	6.98	20.05	0.0000	-0.1893	0.00	0.00
0.2204	-0.2469	2.35	7.42	N.W. & W.	6.26	15.80	0.0000	-0.3959	0.00	0.00
0.0566	-0.2602	1.62	3.94	S. Tasmania	5.93	16.58	0.0000	-0.3576	0.00	0.00
0.7574	1.0185	59.98	28.38	Victoria	26.77	32.61	0.5761	-0.2844	17.50	24.75
2.2229	0.4760	11.46	21.34	N.S.W./A.C.T.	4.65	14.31	0.0000	-0.3248	0.00	0.00
0.0219	-0.1081	0.26	1.02	W.A./S.A.	1.01	6.89	0.2634	8.9267	62.50	3.54
-0.0000	-0.0772	0.00	0.00	Qld./N.T.	0.36	4.63	-0.0000	-0.0772	0.00	0.00
0.2399	-0.0352	1.42	4.50	Overseas	1.74	9.18	0.0000	-0.1893	0.00	0.00

Source: Launceston manufacturing survey, 1980.

LEVEL 6

(i) Fusion coefficient: 29.7

(ii) No. of clusters : 6

(iii) Cluster identification: Cluster (1,2); Cluster (3); Cluster (4); Cluster (5) - Southern Tasmania; Cluster (6,7,8) - Northern Tasmania and Overseas; Cluster (9).

(iv) Character of new clusters:

Cluster (5) - 13 cases. These firms are largely dependent on Southern Tasmanian sources ($\bar{x}$ = 58.0 per cent), but with a relatively high secondary orientation to Launceston ($\bar{x}$ = 25.5 per cent).

Cluster (6,7,8) - 26 cases. Cluster (6,7,8) is identified by its orientation to northern Tasmanian sources (that is, the independent regions of the rest of North and North Eastern Tasmania, and North West and Western Tasmania), plus above average purchases from overseas. Mean purchases from the individual components of the composite source area are North and North Eastern Tasmania (36.7 per cent), North West and Western Tasmania (31.2 per cent) and overseas (7.1 per cent).

(v) Cluster diagnostics:

Cluster (5)			13 cases	All firms			Cluster (6,7,8)			26 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.2697	-0.5329	25.54	20.14	Launceston	46.20	38.78	0.1025	-0.8731	12.35	12.41
0.5727	0.0089	7.15	15.18	N. & N.E.	6.98	20.05	3.3710	1.4838	36.73	36.82
0.0306	-0.3423	0.85	2.76	N.W. & W.	6.26	15.80	2.7970	1.5804	31.23	26.43
1.3756	3.1412	58.00	19.44	S. Tasmania	5.93	16.58	0.2397	-0.1094	4.12	8.12
0.1476	-0.6088	6.92	12.53	Victoria	26.77	32.61	0.0831	-0.6005	7.19	9.40
0.0094	-0.2980	0.38	1.39	N.S.W./A.C.T.	4.65	14.31	0.0079	-0.2953	0.42	1.27
-0.0000	-0.1460	0.00	0.00	W.A./S.A.	1.01	6.89	0.1310	-0.0232	0.85	2.49
-0.0000	-0.0772	0.00	0.00	Qld./N.T.	0.36	4.63	-0.0000	-0.0772	0.00	0.00
0.1065	-0.0636	1.15	3.00	Overseas	1.74	9.18	5.5609	0.5857	7.12	21.65

Source: Launceston manufacturing survey, 1980.

LEVEL 7

(i) Fusion coefficient: 27.3

(ii) No. of clusters : 7

(iii) Cluster identification: Cluster (1) - Victoria; Cluster (2) - New South Wales/Australian Capital Territory; Cluster (3); Cluster (4); Cluster (5); Cluster (6,7,8); Cluster (9).

(iv) Character of new clusters:

Cluster (1) - 51 cases. A decidedly Victorian orientation characterises Cluster 1. On average, these firms purchase 69.7 per cent of their inputs from this source area, with virtually no links with any other region except for the usual, but well below average, purchases for minor requirements from Launceston itself ($\bar{x}$ = 19.9 per cent).

Cluster (2) - 14 cases. Cluster 2 firms are identified on the basis of purchases of substantial quantities of their inputs directly from New South Wales/Australian Capital Territory sources, yet the degree of orientation to this source area is the lowest of all the discrete clusters identified thus far. Mean purchases from New South Wales/Australian Capital Territory are only 47.3 per cent for these firms, although there is considerable intra-cluster variation for this particular variable. Thus, some of the 14 firms are clearly very dependent on this source area, but at the same time there are others utilising sources located in the region for limited, but most probably very specialised, purchases. In such cases supplementary purchases are made from Victoria and, as for all clusters, Launceston. Overall average purchases from these latter sources are 24.5 and 22.6 per cent respectively.

(v) Cluster diagnostics:

Cluster (1)			51 cases	All firms			Cluster (2)			14 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.2639	-0.6358	21.55	19.92	Launceston	46.20	38.78	0.2643	-0.6076	22.64	19.94
0.0457	-0.3088	0.78	4.29	N. & N.E.	6.98	20.05	0.0641	-0.2802	1.36	5.08
0.2752	-0.2098	2.94	8.29	N.W. & W.	6.26	15.80	0.0013	-0.3823	0.21	0.58
0.0501	-0.2642	1.55	3.71	S. Tasmania	5.93	16.58	0.0856	-0.2456	1.86	4.85
0.4513	1.3173	69.73	21.90	Victoria	26.77	32.61	0.3678	-0.0697	24.50	19.77
0.1131	-0.2111	1.63	4.81	N.S.W./A.C.T.	4.65	14.31	1.9082	2.9792	47.29	19.77
0.0275	-0.0976	0.33	1.14	W.A./S.A.	1.01	6.89	-0.0000	-0.1460	0.00	0.00
-0.0000	-0.0772	0.00	0.00	Qld./N.T.	0.36	4.63	-0.0000	-0.0772	0.00	0.00
0.2133	-0.0569	1.22	4.24	Overseas	1.74	9.18	0.3521	0.0441	2.14	5.45

Source: Launceston manufacturing survey, 1980.

LEVEL 8

(i) Fusion coefficient: 21.4

(ii) No. of clusters : 8

(iii) Cluster identification: Cluster (1); Cluster (2); Cluster (3); Cluster (4); Cluster (5); Cluster (6,7) - Northern Tasmania, Cluster (8) - Overseas; Cluster (9).

(iv) Character of new clusters:

Cluster (6,7) - 23 cases. A truly northern Tasmanian orientation exists for Cluster (6,7) firms, with average purchases of 41.5 per cent from the rest of North and North Eastern Tasmania and 32.7 per cent from North West and Western Tasmania.

Cluster (8) - 3 cases. These firms display a substantial overseas orientation ($\bar{x}$ = 59.3 per cent), and the fact that they form part of the Tasmanian based branch of the classification rather than the branch oriented to sources outside Tasmania is the result of the secondary dependence of this very small sub-group on North West and Western Tasmanian sources ($\bar{x}$ = 20.0 per cent).

(v) Cluster diagnostics:

Cluster (6,7)			23 cases	All firms			Cluster (8)			3 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.0865	-0.8809	12.04	11.41	Launceston	46.20	38.78	0.3228	-0.8133	14.67	22.03
3.3136	1.7227	41.52	36.50	N. & N.E.	6.98	20.05	-0.0000	-0.3479	0.00	0.00
2.9913	1.6731	32.70	27.33	N.W. & W.	6.26	15.80	1.2013	0.8697	20.00	17.32
0.2659	-0.0927	4.39	8.55	S. Tasmania	5.93	16.58	0.0437	-0.2370	2.00	3.46
0.0906	-0.5878	7.61	9.82	Victoria	26.77	32.61	0.0263	-0.6984	4.00	5.29
0.0088	-0.2914	0.48	1.34	N.S.W./A.C.T.	4.65	14.31	0.0000	-0.3248	0.00	0.00
0.1465	-0.0072	0.96	2.64	W.A./S.A.	1.01	6.89	0.0000	-0.1460	0.00	0.00
-0.0000	-0.0772	0.00	0.00	Qld./N.T.	0.36	4.63	-0.0000	-0.0772	0.00	0.00
0.0145	-0.1562	0.30	1.11	Overseas	1.74	9.18	14.4917	6.2738	59.33	34.95

Source: Launceston manufacturing survey, 1980.

LEVEL 9

(i) Fusion coefficient: 7.1

(ii) No. of clusters : 9

(iii) Cluster identification: Cluster (1); Cluster (2); Cluster (3); Cluster (4); Cluster (5); Cluster (6) - Northern Tasmania; Cluster (7) - North and North Eastern Tasmania; Cluster (8); Cluster (9).

(iv) Character of new clusters:

Cluster (6) - 16 cases. This cluster exhibits a residual northern Tasmanian orientation, albeit dominated by North West and Western Tasmanian sources. Mean purchases from this latter source are 47.0 per cent, with a substantial secondary orientation, well above average, to sources in the rest of North and North Eastern Tasmania ($\bar{x}$ = 21.8 per cent), and minor purchases from Launceston ($\bar{x}$ = 15.8 per cent) and Victorian ($\bar{x}$ = 10.8 per cent) sources.

Cluster (7) - 7 cases. These firms are very dependent on the rest of the North and North Eastern Tasmanian regional source area, excluding Launceston, ($\bar{x}$ = 86.7 per cent), with minor (above average purchases) from Southern Tasmania ($\bar{x}$ = 9.4 per cent). Unlike all other clusters within this branch of the classification, there is only minimal dependence on Launceston ($\bar{x}$ = 3.4 per cent), and virtually no purchases are made from Victoria ($\bar{x}$ = 0.4 per cent).

(v) Cluster diagnostics:

Cluster (6)			16 cases	All firms			Cluster (7)			7 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.0920	-0.7837	15.81	11.76	Launceston	46.20	38.78	0.0046	-1.1031	3.43	2.64
1.3254	0.7367	21.75	23.09	N. & N.E.	6.98	20.05	0.3189	3.9763	86.71	11.32
1.5157	2.5782	47.00	19.46	N.W. & W.	6.26	15.80	0.0000	-0.3959	0.00	0.00
0.1088	-0.2257	2.19	5.47	S. Tasmania	5.93	16.58	0.5481	0.2101	9.43	12.27
0.0999	-0.4914	10.75	10.31	Victoria	26.77	32.61	0.0012	-0.8080	0.43	1.13
0.0122	-0.2768	0.69	1.58	N.S.W./A.C.T.	4.65	14.31	-0.0000	-0.3248	0.00	0.00
0.2019	0.0536	1.38	3.10	W.A./S.A.	1.01	6.89	-0.0000	-0.1460	0.00	0.00
-0.0000	-0.0772	0.00	0.00	Qld./N.T.	0.36	4.63	-0.0000	-0.0772	0.00	0.00
0.0205	-0.1417	0.44	1.32	Overseas	1.74	9.18	0.0000	-0.1893	0.00	0.00

Source: Launceston manufacturing survey, 1980.

A9.2 Structure of the classification of the input linkages of Launceston only manufacturers.

Launceston only manufacturers differ from the entire population of firms in regional input linkages only marginally, basically because this particular sub-population constitutes the majority (75.0 per cent) of Launceston manufacturing operations included in the analysis (Table A9.1). The essential difference is a fractionally higher dependence of Launceston only firms on Tasmanian sources ($\bar{x}$ = 69.5 per cent compared with 65.4 per cent for all firms), and the complementary slightly lesser dependence on external sources. With respect to individual source areas, the differences are most marked for Launceston, from which Launceston only operators display a greater propensity to purchase their inputs ($\bar{x}$ = 55.5 per cent), and for the rest of North and North Eastern Tasmania, where purchases by this sub-population of firms are well below the average for all operations ($\bar{x}$ = 2.8 and 7.0 per cent respectively).

Table A9.1: Means and standard deviations of the regional input linkage data set, Launceston only manufacturers.

	Launceston only		All firms
Source region	Mean[1]	Standard deviation	Mean[1]
Launceston	55.52	37.83	46.20
Rest of N. and N.E. Tasmania	2.83	12.65	6.98
N.W. and W. Tasmania	5.18	15.04	6.26
Southern Tasmania	6.00	16.95	5.93
Victoria	24.79	31.47	26.77
N.S.W./A.C.T.	3.40	12.26	4.65
W.A./S.A.	1.18	7.89	1.01
Qld/N.T.	0.00		0.36
Overseas	1.05	5.67	1.74
No. of firms	126		168

1. Mean of the percentage of total value of purchases from the regions.

Source: Launceston manufacturing survey, 1980.

Numeric variable correlations for this data subset also present a pattern very similar to that for the entire set of firms. Inter-variable correlations are all very low except for the negative correlation between Launceston and Victorian sources, yet in this case it is considerably stronger, at r = -0.6654. Thus, the tendency among a number of firms to use either Launceston or Victorian sources, but not both, is greater for Launceston only manufacturers. The only other important trend evident, which also emerged in the analysis of all firms, is the consistently negative correlation between Launceston and all other source areas, emphasising the existence of a Launceston dependent subset of firms.

The result of the classificatory technique is a structure exhibiting a substantial drop in coefficient value between the fusion to seven clusters, at a value of 18.532, and the fusion to eight clusters, at a value of 3.446, providing a particularly clearly defined cut-off (Figure A9.2).

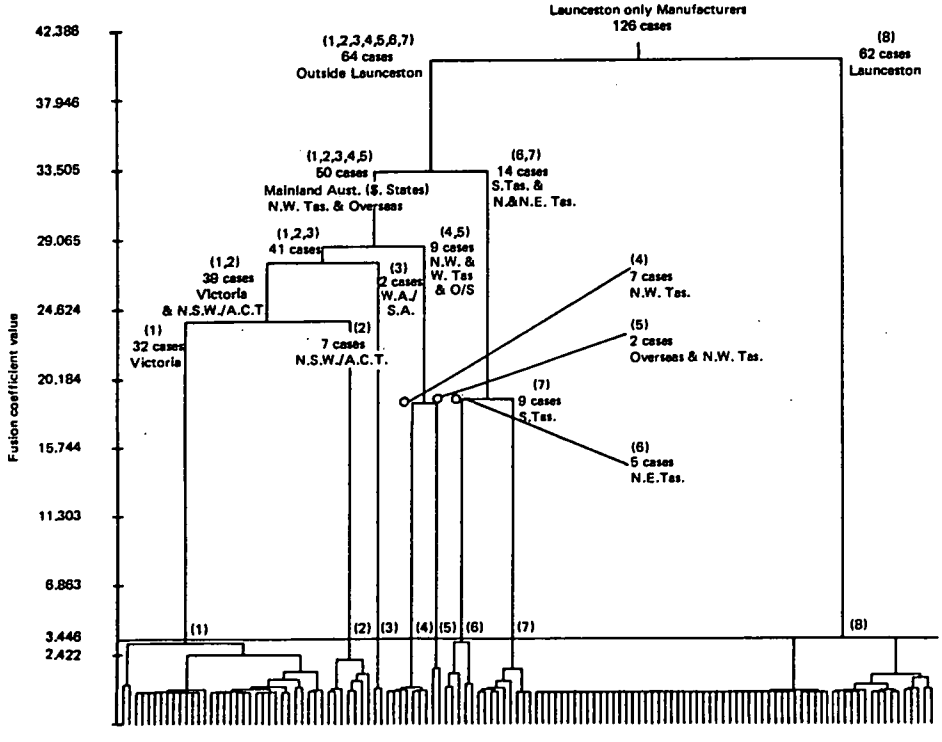


Figure A9.2: Dendrogram of regional input linkages, Launceston only manufacturers.

The structure of the classification is as follows:

LEVEL 1

(i) Fusion coefficient: 40.4.

(ii) No. of clusters : 1

(iii) Cluster identification: (1,2,3,4,5,6,7,8) - 126 cases. All Launceston only firms.

LEVEL 2

(i) Fusion coefficient: 33.3

(ii) No. of clusters : 2

(iii) Cluster identification: (Cluster (1,2,3,4,5,6,7) - Outside Launceston; Cluster (8) - Launceston.

(iv) Character of new clusters:

Cluster (1,2,3,4,5,6,7) - 64 cases. This cluster represents a residual orientation resulting from the segregation of a Launceston oriented subset. It reflects a composite of the alternative regional sources, again best described as a dependence outside Launceston. Purchases from each of the regions beyond the city are above average, and are particularly marked for Victoria ($\bar{x}$ = 42.3 per cent). High intra-cluster variation is evident.

Cluster (8) - 62 cases. Cluster 8 comprises firms purchasing virtually all inputs from Launceston sources ($\bar{x}$ = 90.3 per cent). Negligible purchases are made from alternative source areas other than minor links with Victoria ($\bar{x}$ = 6.7 per cent) which was earlier identified as permeating the purchase patterns of firms with all forms of orientation.

(v) Cluster diagnostics:

Cluster (1,2,3,4,5,6,7) 64 cases				Launceston only manufacturers			Cluster (8) 62 cases			
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.1897	-0.8906	21.83	16.48	Launceston	55.52	37.83	0.1620	0.9193	90.31	15.23
1.8523	0.1731	5.02	17.22	N. & N.E.	2.83	12.65	0.0722	-0.1787	0.56	3.40
1.7517	0.2560	9.03	19.90	N.W. & W.	5.18	15.04	0.1004	-0.2642	1.21	4.76
1.7782	0.2959	11.02	22.60	S. Tasmania	6.00	16.95	0.0260	-0.3055	0.82	2.73
1.2099	0.5557	42.28	34.61	Victoria	24.79	31.47	0.1411	-0.5737	6.74	11.82
1.8500	0.2474	6.44	16.68	N.S.W./A.C.T.	3.40	12.26	0.0081	-0.2553	0.27	1.10
1.9400	0.1353	2.25	10.99	W.A./S.A.	1.18	7.89	0.0065	-0.1397	0.08	0.64
0.0000	0.0000	0.00	0.00	Qld./N.T.	0.00		0.0000	0.0000	0.00	0.00
1.9179	0.1791	2.06	7.85	Overseas	1.05	5.67	-0.0000	-0.1848	0.00	0.00

Source: Launceston manufacturing survey, 1980.

LEVEL 3

(i) Fusion coefficient: 28.5

(ii) No. of clusters : 3

(iii) Cluster identification: Cluster (1,2,3,4,5) - Mainland Australia (southern states), North West and Western Tasmania and Overseas; Cluster (6,7) - Southern Tasmania and North and North Eastern Tasmania; Cluster (8).

(iv) Character of new clusters:

Cluster (1,2,3,4,5) - 50 cases. This cluster comprises firms oriented in the main to the southern states of mainland Australia ($\bar{x}$ = 63.8 per cent), especially Victoria ($\bar{x}$ = 52.8 per cent), with a secondary orientation to North West and Western Tasmanian ($\bar{x}$ = 11.1 per cent) and Overseas ($\bar{x}$ = 2.6 per cent) sources.

Cluster (6,7) - 14 cases. These firms purchase principally from Southern Tasmania ($\bar{x}$ = 46.5 per cent) and North and North Eastern Tasmania ($\bar{x}$ = 22.2 per cent), thereby identifying the orientation of the cluster in terms of a composite of these two areas. There is the usual support from the Launceston ($\bar{x}$ = 24.6 per cent) and Victorian ($\bar{x}$ = 4.9 per cent) source areas.

(v) Cluster diagnostics:

Cluster (1,2,3,4,5)			50 cases	Launceston only manufacturers			Cluster (6,7)			14 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.1706	-0.9109	21.06	15.63	Launceston	55.52	37.83	0.2690	-0.8181	24.57	19.62
0.0061	-0.2075	0.20	0.99	N. & N.E.	2.83	12.65	6.4065	1.5324	22.21	32.02
2.1451	0.3962	11.14	22.02	N.W. & W.	5.18	15.04	0.0577	-0.2449	1.50	3.61
0.0385	-0.2903	1.08	3.32	S. Tasmania	6.00	16.95	2.4306	2.3895	46.50	26.42
1.0210	0.8887	52.76	31.80	Victoria	24.79	31.47	0.0654	-0.6336	4.86	8.05
2.2854	0.3862	8.14	18.54	N.S.W./A.C.T.	3.40	12.26	0.0119	-0.2486	0.36	1.34
2.4646	0.2152	2.88	12.38	W.A./S.A.	1.18	7.89	-0.0000	-0.1499	0.00	0.00
0.0000	0.0000	0.00	0.00	Qld./N.T.	0.00		0.0000	0.0000	0.00	0.00
2.4175	0.2809	2.64	8.81	Overseas	1.05	5.67	-0.0000	-0.1848	0.00	0.00

Source: Launceston manufacturing survey, 1980.

LEVEL 4

(i) Fusion coefficient: 27.5

(ii) No. of clusters : 4

(iii) Cluster identification: Cluster (1,2,3) - Mainland Australia (southern states); Cluster (4,5) - North West and Western Tasmania and Overseas; Cluster (6,7); Cluster (8).

(iv) Character of new clusters:

Cluster (1,2,3) - 41 cases. This cluster of firms exhibits a mainland Australian - southern states orientation since no Launceston only manufacturers purchase from Queensland/Northern Territory sources. Victoria ($\bar{x}$ = 61.6 per cent) is the dominant individual source region.

Cluster (4,5) - 9 cases. Cluster (4,5) is dominated by purchases from North West and Western Tasmania ($\bar{x}$ = 54.4 per cent), but also discriminated by above average purchases from overseas ($\bar{x}$ = 9.1 per cent). The remaining links, whilst rather high, but not relevant in the definition of the cluster, are with sources in Launceston ($\bar{x}$ = 21.6 per cent) and in Victoria ($\bar{x}$ = 12.3 per cent).

(v) Cluster diagnostics:

Cluster (1,2,3)			41 cases	Launceston only manufacturers			Cluster (4,5)			9 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.1880	-0.9138	20.95	16.40	Launceston	55.52	37.83	0.1050	-0.8978	21.56	12.26
0.0038	-0.2137	0.12	0.78	N. & N.E.	2.83	12.65	0.0174	-0.1794	0.56	1.67
0.1514	-0.2360	1.63	5.85	N.W. & W.	5.18	15.04	1.0009	3.2763	54.44	15.04
0.0442	-0.2849	1.17	3.56	S. Tasmania	6.00	16.95	0.0139	-0.3147	0.67	2.00
0.7788	1.1708	61.63	27.77	Victoria	24.79	31.47	0.0952	-0.3960	12.33	9.71
2.6909	0.5220	9.80	20.11	N.S.W./A.C.T.	3.40	12.26	0.0185	-0.2324	0.56	1.67
2.9821	0.2737	3.34	13.62	W.A./S.A.	1.18	7.89	0.0875	-0.0513	0.78	2.33
0.0000	0.0000	0.00	0.00	Qld./N.T.	0.00		0.0000	0.0000	0.00	0.00
0.5362	0.0303	1.22	4.15	Overseas	1.05	5.67	10.3379	1.4226	9.11	18.22

Source: Launceston manufacturing survey, 1980

LEVEL 5

(i) Fusion coefficient: 23.8

(ii) No. of clusters : 5

(iii) Cluster identification: Cluster (1,2) - Victoria and New South Wales/Australian Capital Territory; Cluster (3) - Western Australia/South Australia; Cluster (4,5); Cluster (6,7); Cluster (8).

(iv) Character of new clusters:

Cluster (1,2) - 39 cases. Purchases from Victoria ($\bar{x}$ = 63.9 per cent) dominate Cluster (1,2), with above average purchases from New South Wales/Australian Capital Territory ($\bar{x}$ = 10.3 per cent), and a minor dependence on Launceston sources ($\bar{x}$ = 21.0 per cent).

Cluster (3) - 2 cases. Cluster 3 is a specialised cluster purchasing, on average, 62.5 per cent of their total inputs from the most spatially extended of the mainland Australian (southern states) sources - Western Australia/South Australia. There are, nonetheless, important links with Victoria ($\bar{x}$ = 17.5 per cent) and Launceston ($\bar{x}$ = 20.0 per cent).

(v) Cluster diagnostics:

Cluster (1,2)			39 cases	Launceston only manufacturers			Cluster (3)			2 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.1896	-0.9125	21.00	16.47	Launceston	55.52	37.83	0.3144	-0.9389	20.00	21.21
0.0040	-0.2132	0.13	0.80	N. & N.E.	2.83	12.65	0.0000	-0.2233	0.00	0.00
0.1588	-0.2304	1.72	5.99	N.W. & W.	5.18	15.04	0.0000	-0.3447	0.00	0.00
0.0463	-0.2814	1.23	3.65	S. Tasmania	6.00	16.95	0.0000	-0.3540	0.00	0.00
0.6947	1.2427	63.90	26.23	Victoria	24.79	31.47	0.6186	-0.2318	17.50	24.75
2.7972	0.5630	10.31	20.51	N.S.W./A.C.T.	3.40	12.26	0.0000	-0.2777	0.00	0.00
0.0213	-0.1109	0.31	1.15	W.A./S.A.	1.18	7.89	0.2009	7.7739	62.50	3.54
0.0000	0.0000	0.00	0.00	Qld./N.T.	0.00		0.0000	0.0000	0.00	0.00
0.5619	0.0414	1.28	4.25	Overseas	1.05	5.67	0.0000	-0.1848	0.00	0.00

Source: Launceston manufacturing survey, 1980.

LEVEL 6

(i) Fusion coefficient: 18.8

(ii) No. of clusters : 6

(iii) Cluster identification: Cluster (1) - Victoria; Cluster (2) - New South Wales/Australian Capital Territory; Cluster (3); Cluster (4,5); Cluster (6,7); Cluster (8).

(iv) Character of new clusters.

Cluster (1) - 32 cases. This cluster identifies a relatively large sub-population of Launceston only manufacturers very dependent on the most important individual mainland Australian source region - Victoria. Mean Victorian purchases are 72.3 per cent, with little dependence on any other region except for the usual supplementary purchases made direct from Launceston ($\bar{x}$ = 21.2 per cent).

Cluster (2) - 9 cases. Cluster 2 comprises firms identified as being primarily dependent on New South Wales/Australian Capital Territory sources, but only one half of total inputs ($\bar{x}$ = 51.0 per cent) are purchased from this source area. Victoria remains as an important secondary source, with purchases fractionally above the average for the entire sub-population of firms ($\bar{x}$ = 25.3 per cent), and additional links exist with Launceston ($\bar{x}$ = 20.1 per cent).

(v) Cluster diagnostics:

Cluster (1)			32 cases	Launceston only manufacturers			Cluster (2)			7 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.1741	-0.9075	21.19	15.79	Launceston	55.52	37.83	0.3003	-0.9352	20.14	20.73
0.0049	-0.2110	0.16	0.88	N. & N.E.	2.83	12.65	0.0000	-0.2233	0.00	0.00
0.1916	-0.2096	2.03	6.58	N.W. & W.	5.18	15.04	0.0025	-0.3257	0.29	0.76
0.0505	-0.2802	1.25	3.81	S. Tasmania	6.00	16.95	0.0318	-0.2866	1.14	3.02
0.3322	1.5111	72.34	18.14	Victoria	24.79	31.47	0.5426	0.0156	25.29	23.18
0.1287	-0.1630	1.41	4.40	N.S.W./A.C.T.	3.40	12.26	1.3881	3.8820	51.00	14.45
0.0257	-0.1024	0.38	1.26	W.A./S.A.	1.18	7.89	0.0000	-0.1499	0.00	0.00
0.0000	0.0000	0.00	0.00	Qld./N.T.	0.00		0.0000	0.0000	0.00	0.00
0.4887	0.0081	1.09	3.96	Overseas	1.05	5.67	1.0005	0.1932	2.14	5.67

Source: Launceston manufacturing survey, 1980.

LEVEL 7

(i) Fusion coefficient: 18.5

(ii) No. of clusters : 7

(iii) Cluster identification: Cluster (1); Cluster (2); cluster (3); Cluster (4,5); Cluster (6) - North and North Eastern Tasmania; Cluster (7) - Southern Tasmania; Cluster (8).

(iv) Character of new clusters:

Cluster (6) - 5 cases. The orientation of these firms to the rest of North and North Eastern Tasmania, whilst very substantial at a mean value of 59.2 per cent, is nonetheless coupled with a secondary dependence on Southern Tasmanian sources from where above average purchases of 22.2 per cent of the total value of inputs are made. In aggregate, therefore, Southern Tasmanian sources are important for at least nine and upwards to 14 (including Cluster 7) Launceston only manufacturers.

Cluster (7) - 9 cases. These firms are heavily dependent on Southern Tasmanian sources ($\bar{x}$ = 60.0 per cent). Further, purchases from outside Tasmania are negligible, a mean value of less than four per cent, all of which are from Victorian sources. Indeed, this particular subset of

firms is essentially restricted to Launceston sources only ($\bar{x}$ = 34.7 per cent) for subsidiary purchases over and above the major requirements derived from Southern Tasmania.

(v) Cluster diagnostics:

Cluster (6)			5 cases	Launceston only manufacturers			Cluster (7)			9 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.0086	-1.2984	6.40	3.51	Launceston	55.52	37.83	0.2085	-0.5513	34.67	17.28
3.8930	4.4557	59.20	24.96	N. & N.E.	2.83	12.65	0.1562	-0.0916	1.67	5.00
0.1327	-0.0786	4.00	5.48	N.W. & W.	5.18	15.04	0.0005	-0.3373	0.11	0.33
1.6332	0.9558	22.20	21.66	S. Tasmania	6.00	16.95	1.1348	3.1860	60.00	18.06
0.1709	-0.5591	7.20	13.01	Victoria	24.79	31.47	0.0154	-0.6749	3.56	3.91
0.0333	-0.1961	1.00	2.24	N.S.W./A.C.T.	3.40	12.26	0.0000	-0.2777	0.00	0.00
0.0000	-0.1499	0.00	0.00	W.A./S.A.	1.18	7.89	0.0000	-0.1499	0.00	0.00
0.0000	0.0000	0.00	0.00	Qld./N.T.	0.00		0.0000	0.0000	0.00	0.00
0.0000	-0.1848	0.00	0.00	Overseas	1.05	5.67	0.0000	-0.1848	0.00	0.00

Source: Launceston manufacturing survey, 1980.

LEVEL 8

(i) Fusion coefficient: 3.4

(ii) No. of clusters : 8

(iii) Cluster identification: Cluster (1); Cluster (2); Cluster (3); Cluster (4) - North West and Western Tasmania; Cluster (5) - Overseas and North West and Western Tasmania; Cluster (6); Cluster (7); Cluster (8).

(iv) Character of new clusters:

Cluster (4) - 7 cases. These firms are oriented to North West and Western Tasmanian sources ($\bar{x}$ = 61.4 per cent), with below average supporting purchases from Launceston ($\bar{x}$ = 21.4 per cent), and from Victoria ($\bar{x}$ = 14.4 per cent).

Cluster (5) - 2 cases. This cluster isolates the very specialised purchase patterns of two firms substantially dependent on overseas sources ($\bar{x}$ = 40.0 per cent), but at the same time there is a considerable residual

orientation to North West and Western Tasmania ($\bar{x}$ = 30.0 per cent). Thus, the somewhat unusual definition of the parent cluster initiating the branch of the classification identifying an essentially mainland Australian orientation.

(v) Cluster diagnostics:

Cluster (4)			7 cases	Launceston only manufacturers			Cluster (5)			2 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
0.0645	-0.9012	21.43	9.61	Launceston	55.52	37.83	0.4527	-0.8861	22.00	25.46
0.0223	-0.1669	0.71	1.89	N. & N.E.	2.83	12.65	0.0000	-0.2233	0.00	0.00
0.2018	3.7408	61.43	6.75	N.W. & W.	5.18	15.04	0.0000	1.6506	30.00	0.00
-0.0000	-0.3540	0.00	0.00	S. Tasmania	6.00	16.95	0.0627	-0.1770	3.00	4.24
0.0952	-0.3294	14.43	9.71	Victoria	24.79	31.47	0.0505	-0.6290	5.00	7.07
0.0238	-0.2194	0.71	1.89	N.S.W./A.C.T.	3.40	12.26	0.0000	-0.2777	0.00	0.00
0.1125	-0.0231	1.00	2.65	W.A./S.A.	1.18	7.89	0.0000	-0.1499	0.00	0.00
0.0000	0.0000	0.00	0.00	Qld./N.T.	0.00		0.0000	0.0000	0.00	0.00
0.0178	-0.1344	0.29	0.76	Overseas	1.05	5.67	6.2255	6.8724	40.00	14.14

Source: Launceston manufacturing survey, 1980.

A9.3 Structure of the classification of the input linkages of multi-locational Launceston manufacturers.

The regional input linkage pattern of multi-locational Launceston manufacturers deviates quite markedly from that of the entire population of Launceston operations (Table A9.2). The most important differential occurs for Launceston sources, from which the majority of firms in this sub-population make minimal purchases. The overall mean Launceston purchase for these operations is 18.2 per cent, compared with 46.2 per cent for all firms and 55.5 per cent for Launceston only operators. Thus, the overriding character of the Launceston operations of multi-locational firms is a dependence on sources outside Launceston, reflected by the fact that purchases from all other source areas are above the mean for all firms except for Southern Tasmania and Western Australia/South Australia. However, for Southern Tasmania the mean values are very similar (5.72 per cent compared with 5.93 per cent for all firms), and for Western Australia/South Australia mean purchases are so small as to have little effect (0.47 per cent compared with 1.01 per cent for the entire population).

The reduced dependence on Launceston sources is so severe, that even with the sub-population's greater orientation to the two other Tasmanian sources (especially to the rest of North and North Eastern Tasmania), overall Tasmanian orientation is well below that for the entire population firms and the Launceston only subset. Mean values are 52.9, 65.4 and 69.5 per cent respectively. Accordingly, multi-locational Launceston manufacturers display more spatially extended input linkages than either of the other populations of firms, with mean purchases from external

sources of 46.8 per cent. Interestingly, direct purchases by these firms from independent external sources ($\bar{x}$ = 33.5 per cent) approximate those for all Launceston manufacturers ($\bar{x}$ = 34.5 per cent). The additional involvement with sources outside Tasmania ($\bar{x}$ = 13.3 per cent) results from intra-organisational transfers of the necessary inputs.

Table A9.2: Means and standard deviations of the regional input linkage data set, multi-locational Launceston manufacturers.

Source region.[1]		Multi-locational firms			All firms
		Mean[2]	Standard deviation	Regional Mean[2]	Mean[2]
Launceston		18.24	26.32	18.24	46.20
Rest of N. and N.E. Tasmania	- other firms	10.69	17.74	19.43	6.98
	- own firm	8.74	23.92		
N.W. and W. Tasmania	- other firms	8.29	16.57	9.48	6.26
	- own firm	1.19	7.72		
Southern Tasmania	- other firms	5.24	15.46	5.72	5.93
	- own firm	0.48	3.09		
Victoria	- other firms	23.81	31.66	32.71	26.77
	- own firm	8.90	25.32		
N.S.W./A.C.T.	- other firms	4.45	12.07	8.38	4.65
	- own firm	3.93	15.72		
W.A./S.A.	- other firms	0.45	1.80	0.47	1.01
	- own firm	0.02	0.15		
Qld./N.T.	- other firms	1.43	9.26	1.43	0.36
	- own firm	0.00			
Overseas	- other firms	3.38	12.83	3.81	1.74
	- own firm	0.43	2.78		
No. of firms		42			168

1. Note: In this regional breakdown, purchases from other firms and intra-organisational transfers are treated as separate entities, (not a segregation of the 'own firm' component from the regional total as in the preceding analyses), since the analysis is concerned with organisational and regional variations.

2. The mean of the percentage of total value of purchases from the regions.

Source: Launceston manufacturing survey, 1980.

However, within the subset of multi-locational firms discrete forms of orientation are difficult to identify. This is initially highlighted by the inter-variable correlations for which most values are extremely low. In only two instances are numeric variable correlations outside the range

$-0.4 \geq r \geq +0.4$. There is a very strong positive correlation between purchases from North West and Western Tasmanian branches and from independent Western Australian/South Australian ($r = 0.8398$) sources, and between purchases from independent and intra-organisational overseas sources ($r = 0.9443$), but in both circumstances, individual firms characterised by singularly unique purchase patterns are responsible. Elsewhere, inter-variable correlations are exceedingly low, nor are there any major trends apparent other than a consistently negative association between purchases from Launceston and from the remaining source areas ($-0.21 \leq r \leq 0.00$). This suggests the possibility of isolated instances of dependence on Launceston which, coupled with the one case oriented to independent and intra-firm overseas sources, represents the only concentrated orientation of multi-locational Launceston operations to individual sources. In the main, the evidence suggests extremely complex purchase patterns for the majority of operations constituting this sub-population of Launceston manufacturers.

This complexity is readily verified in the structure resulting from the classification of the input purchase patterns of these firms, and poses a major problem in the determination of the limit to the classificatory process (Figure A9.3). Substantial reductions in the fusion coefficient value exist at two levels within the structure. The larger of these exists between the fusions to three and to four clusters at values of 7.322 and 5.177 respectively. A cut-off at this level (the lower of the two values) presents a structure based on four clusters, two of them containing individual cases. The second, smaller discontinuity occurs between the fusions to 12 and 13 clusters at values of 3.665 and 2.142 respectively. However, a cut-off at the value of 2.142 presents a vastly more complex

structure of very small clusters, including four additional single firm clusters. Thus, the somewhat unsatisfactory tendency towards an individual basis for discrimination is equally strong at this level.

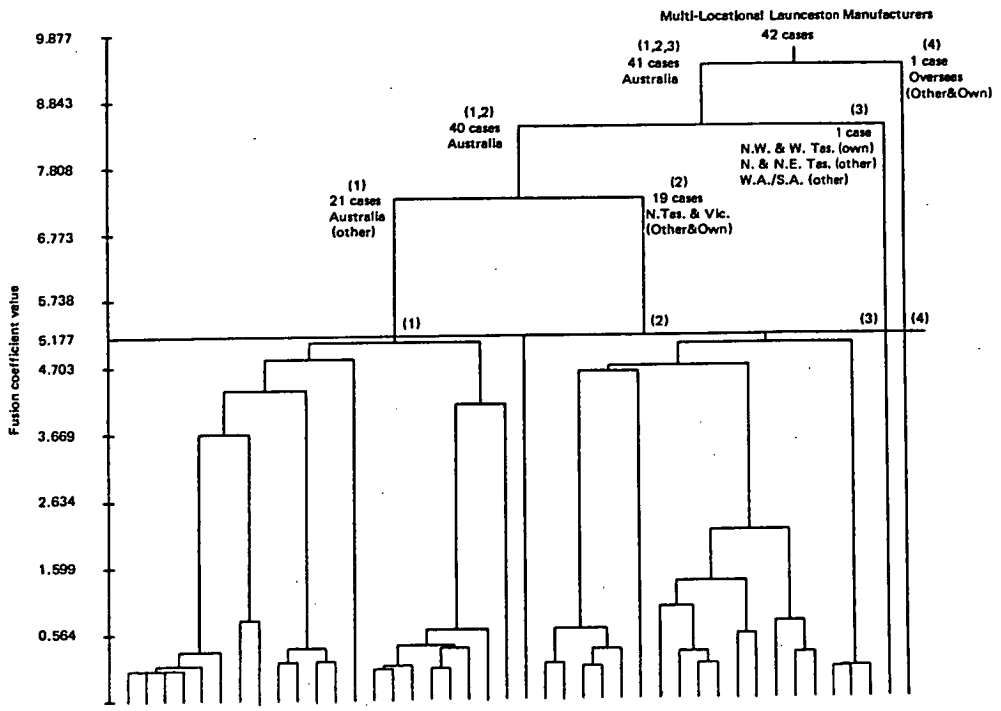


Figure A9.3: Dendrogram of regional input linkages, multi-locational Launceston manufacturers.

Accordingly, the objectivity involved in stopping the process when the most substantial drop in the fusion coefficient is observed, combined with simplicity of presentation, are predisposing factors in the decision to impose the limit at the fusion coefficient value of 5.177, and adopting four clusters as the basis of the classification. Nonetheless, consideration is given to the detail pertaining to the fusions down to the value of 2.142 in the ensuing discussion of the major clusters in the structure adopted, particularly in terms of specific orientations of some of the firms constituting each of the higher level clusters.

The structure of the classification is as follows:

LEVEL 1

(i) Fusion coefficient: 9.4

(ii) No. of clusters : 1

(iii) Cluster identification: (1,2,3,4) - 42 cases. All multi-locational Launceston manufacturers.

LEVEL 2

(i) Fusion coefficient: 8.4

(ii) No. of clusters : 2

(iii) Cluster identification: Cluster (1,2,3) - Australia; Cluster (4) - Overseas (other firms and own firm).

(iv) Character of new clusters:

Cluster (1,2,3) - 41 cases. These, the majority of firms, purchase from a wide variety of sources. The proportion of inputs derived from all of the individual Tasmanian and mainland Australian sources are marginally above average, thus the orientation for the cluster overall is identified as Australian. Nonetheless, the most dominant source areas are northern Tasmania (comprising Launceston, the rest of North and North eastern Tasmania, and North West and Western Tasmania: $\bar{x}$ = 48.3 per cent), together with Victoria and New South Wales/Australian Capital Territory ($\bar{x}$ = 42.0 per cent).

Cluster (4) - 1 case. The single operation comprising this cluster purchases 80 per cent of its inputs directly from independent overseas sources, with a further 18 per cent from overseas establishments of the one company. The only Australian purchases are in the form of incidentals

amounting to two per cent of the total value of inputs, and these are derived from Victoria.

(v) Cluster diagnostics:

Cluster (1,2,3)			41 cases	Multi-locational Launceston manufacturers			Cluster (4)			1 case
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
1.0127	0.0169	18.68	26.48	Launceston	18.24	26.32	0.0000	-0.6931	0.00	0.00
1.0157	0.0147	10.95	17.88	N. & N.E.	10.69	17.74	0.0000	-0.6027	0.00	0.00
1.0216	0.0089	8.95	24.17	N. & N.E. (I.F.)	8.74	23.92	0.0000	-0.3654	0.00	0.00
1.0186	0.0122	8.49	16.72	N.W. & W.	8.29	16.57	0.0000	-0.5001	0.00	0.00
1.0244	0.0038	1.22	7.81	N.W. & W. (I.F.)	1.19	7.72	0.0000	-0.1543	0.00	0.00
1.0221	0.0083	5.37	15.63	S. Tasmania	5.24	15.46	0.0000	-0.3388	0.00	0.00
1.0244	0.0038	0.49	3.12	S. Tasmania (I.F.)	0.48	3.09	0.0000	-0.1543	0.00	0.00
1.0105	0.0183	24.39	31.82	Victoria	23.81	31.66	0.0000	-0.7521	0.00	0.00
1.0231	0.0067	9.07	25.61	Victoria (I.F.)	8.90	25.32	0.0000	-0.2727	2.00	0.00
1.0215	0.0090	4.56	12.20	N.S.W./A.C.T.	4.45	12.07	0.0000	-0.3688	0.00	0.00
1.0234	0.0061	4.02	15.90	N.S.W./A.C.T. (I.F.)	3.93	15.72	0.0000	-0.2500	0.00	0.00
1.0234	0.0061	0.46	1.82	W.A./S.A.	0.45	1.80	0.0000	-0.2517	0.00	0.00
1.0244	0.0038	0.02	0.16	W.A./S.A. (I.F.)	0.02	0.15	0.0000	-0.1543	0.00	0.00
1.0244	0.0038	1.46	9.37	Qld./N.T.	1.43	9.26	0.0000	-0.1543	0.00	0.00
0.0000	0.0000	0.00	0.00	Qld./N.T. (I.F.)	0.00		0.0000	0.0000	0.00	0.00
0.1110	-0.1457	1.51	4.27	Overseas	3.38	12.83	0.0000	5.9741	80.00	0.00
-0.0000	-0.1543	0.00	0.00	Overseas (I.F.)	0.43	2.78	0.0000	6.3264	18.00	0.00

(I.F.) = Intra-firm.

Source: Launceston manufacturing survey, 1980.

LEVEL 3

(i) Fusion coefficient: 7.3

(ii) No. of clusters : 3

(iii) Cluster identification: Cluster (1,2) - Australia; Cluster (3) - North West and Western Tasmania (own firm), North and North Eastern Tasmania (other firms) and Western Australia/South Australia (other firms); Cluster (4).

(iv) Character of new clusters:

Cluster (1,2) - 40 cases. The basically residual orientation of this cluster is little removed from its parent (Cluster 1,2,3). The only deviation is that in addition to purchases from Overseas sources being below average, so too are purchases from Western Australia/South Australia. Thus, the orientation remains essentially Australian.

Cluster (3) - 1 case. This firm is dependent upon its parent company in North West Tasmania for the principal input (50 per cent of the total value of inputs). Secondary inputs are derived from independent sources located in the more immediately accessible areas of Launceston and North and North Eastern Tasmania (35 per cent), plus direct purchases of non-locally available materials from independent West Australia/South Australian sources (10 per cent).

(v) Cluster diagnostics:

Cluster (1,2)			40 cases	Multi-locational Launceston manufacturers			Cluster (3)			1 case
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
1.0382	0.0204	18.78	26.81	Launceston	18.24	26.32	0.0000	-0.1231	15.00	0.00
1.0349	0.0019	10.73	18.04	N. & N.E.	10.69	17.74	0.0000	0.5249	20.00	0.00
1.0441	0.0183	9.18	24.44	N. & N.E. (I.F.)	8.74	23.92	0.0000	-0.3654	0.00	0.00
1.0378	0.0250	8.70	16.88	N.W. & W.	8.29	16.57	0.0000	-0.5001	0.00	0.00
-0.0000	-0.1543	0.00	0.00	N.W. & W. (I.F.)	1.19	7.72	0.0000	6.3264	50.00	0.00
1.0451	0.0169	5.50	15.80	S. Tasmania	5.24	15.46	0.0000	-0.3388	0.00	0.00
1.0500	0.0077	0.50	3.16	S. Tasmania (I.F.)	0.48	3.09	0.0000	-0.1543	0.00	0.00
1.0208	0.0376	25.00	31.98	Victoria	23.81	31.66	0.0000	-0.7521	0.00	0.00
1.0460	0.0156	9.30	25.90	Victoria (I.F.)	8.90	25.32	0.0000	-0.3517	0.00	0.00
1.0440	0.0184	4.68	12.34	N.S.W./A.C.T.	4.45	12.07	0.0000	-0.3688	0.00	0.00
1.0479	0.0125	4.13	16.09	N.S.W./A.C.T. (I.F.)	3.93	15.72	0.0000	-0.2500	0.00	0.00
0.3095	-0.1265	0.23	1.00	W.A./S.A.	0.45	1.80	0.0000	5.3129	10.00	0.00
1.0500	0.0077	0.03	0.16	W.A./S.A. (I.F.)	0.02	0.15	0.0000	-0.1543	0.00	0.00
1.0500	0.0077	1.50	9.49	Qld./N.T.	1.43	9.26	0.0000	-0.1543	0.00	0.00
0.0000	0.0000	0.00	0.00	Qld./N.T. (I.F.	0.00		0.0000	0.0000	0.00	0.00
0.1119	-0.1525	1.43	4.29	Overseas	3.38	12.83	0.0000	0.1262	5.00	0.00
-0.0000	-0.1543	0.00	0.00	Overseas (I.F.)	0.43	2.78	0.0000	-0.1543	0.00	0.00

(I.F.) = Intra-firm

Source: Launceston manufacturing survey, 1980.

LEVEL 4

(i) Fusion coefficient: 5.2

(ii) No. of clusters : 4

(iii) Cluster identification: Cluster (1) - Australia (other firms); Cluster (2) - Northern Tasmania and Victoria (other firms and own firm); Cluster (3); Cluster (4).

(iv) Character of new clusters:

Cluster (1) - 21 cases. This subset of firms retains the basically Australian orientation in its purchase pattern, although it is not as comprehensive as Cluster (1,2). There is one very important difference, however, namely that the vast majority of purchases from the widely dispersed source areas are from independent suppliers. The only exception to this is the set of purchases averaging 6.0 per cent from establishments of the same organisation in New South Wales/Australian Capital Territory. The independent sources are mostly located in Victoria ($\bar{x}$ = 41.3 per cent), Launceston ($\bar{x}$ = 29.3 per cent), New South Wales/Australian Capital Territory ($\bar{x}$ = 8.1 per cent) and Southern Tasmania ($\bar{x}$ = 7.2 per cent). The minor purchases from Queensland/Northern Territory ($\bar{x}$ = 2.9 per cent) are also above average. Thus, the input linkage orientation of this cluster could be best described as independent Australian sources. However, very few Cluster 1 firms are responsible for the orientation to New South Wales/Australian Capital Territory branches or subsidiaries (N=1), to Queensland/Northern Territory (N=1), and Southern Tasmania (N=2). Indeed, the two latter patterns do not exist as discrete entities, they are accompanied by a substantial supplementary dependence on Victorian sources. It is orientation to independent sources in Victoria, a New South Wales/Victorian combination, and Launceston sources that account for most constituent firms (N=6, 4 and 7 respectively), these details being derived from an examination of cluster diagnostics at lower levels in the classification.

Cluster (2) - 19 cases. This cluster is identified primarily by its concentration on northern Tasmanian sources for major inputs ($\bar{x}$ = 64.7 per cent), including Launceston and intra-organisational sources), but there is also a very important secondary orientation to Victorian sources ($\bar{x}$ = 26.5 per cent), particularly those forming part of the organisational

structure to which the Launceston operation belongs. The individual source areas involved are Launceston ($\bar{x}$ = 7.2 per cent), the rest of North and North Eastern Tasmania ($\bar{x}$ = 20.0 per cent independent, 19.3 per cent - own firm), North West and Western Tasmania ($\bar{x}$ = 18.3 per cent - independent) and Victoria ($\bar{x}$ = 7.0 per cent - independent, 19.6 per cent - own firm). Accordingly, the input purchase pattern for the cluster is labelled as Northern Tasmania/Victoria (independent and intra-firm). Principal intra-cluster variations are assessed in the same manner as that for Cluster 1. Apart from two very complex, but isolated purchase patterns, there are three rather discrete sub-groups of the 19 firms overall, each of which contain firms characterised by reasonable internal consistency, but with marked variations between each. The particular orientation of these, in order of subset size, are independent northern Tasmanian sources (N=9), intra-firm North and North Eastern Tasmanian sources (N=5) and intra-firm Victorian sources (N=3).

(v) Cluster diagnostics:

Cluster (1)			21 cases	Multi-locational Launceston manufacturers			Cluster (2)			19 cases
F-Ratio	T-Value	Mean	Standard Deviation	Variable	Mean	Standard Deviation	F-Ratio	T-Value	Mean	Standard Deviation
1.5663	0.4198	29.29	32.93	Launceston	18.24	26.32	0.1172	-0.4211	7.16	9.01
0.1822	-0.4712	2.33	7.57	N. & N.E.	10.69	17.74	1.4900	0.5249	20.00	21.65
0.0000	-0.3654	0.00	0.00	N. & N.E. (I.F.)	8.74	23.92	1.9007	0.4423	19.32	32.97
0.0000	-0.4972	0.05	0.22	N.W. & W.	8.29	16.57	1.5786	0.6022	18.26	20.82
-0.0000	-0.1543	0.00	0.00	N.W. & W. (I.F.)	1.19	7.72	-0.0000	-0.1543	0.00	0.00
1.8357	0.1263	7.19	20.94	S. Tasmania	5.24	15.46	0.1954	-0.1039	3.63	6.83
-0.0000	-0.1543	0.00	0.00	S. Tasmania (I.F.)	0.48	3.09	2.2105	0.1868	1.05	4.59
1.2360	0.5536	41.33	35.19	Victoria	23.81	31.66	0.1847	-0.5327	6.95	13.60
0.0000	-0.3517	0.00	0.00	Victoria (I.F.)	8.90	25.32	1.9349	0.4216	19.58	35.22
1.8128	0.2978	8.05	16.26	N.S.W./A.C.T.	4.45	12.07	0.0560	-0.2903	0.95	2.86
1.8585	0.1288	5.95	21.43	N.S.W./A.C.T. (I.F.)	3.93	15.72	0.1722	-0.1160	2.11	6.52
-0.0000	-0.2517	0.00	0.00	W.A./S.A.	0.45	1.80	0.6320	0.0119	0.47	1.43
0.0000	-0.1543	0.00	0.00	W.A./S.A. (I.F.)	0.02	0.15	2.2105	0.1868	0.05	0.23
2.0000	0.1543	2.86	13.09	Qld./N.T.	1.43	9.26	-0.0000	-0.1543	0.00	0.00
0.0000	0.0000	0.00	0.00	Qld./N.T. (I.F.)	0.00		0.0000	0.0000	0.00	0.00
0.1958	-0.0520	2.71	5.68	Overseas	3.38	12.83	-0.0000	-0.2636	0.00	0.00
-0.0000	-0.1543	0.00	0.00	Overseas (I.F.)	0.43	2.78	-0.0000	-0.1543	0.00	0.00

(I.F.) = Intra-firm

Source: Launceston manufacturing survey, 1980

APPENDIX 10

WEIGHTED INPUT LINKAGES OF LAUNCESTON MANUFACTURERS

The unweighted, proportional data forming the basis of the discussion of the input linkages of the Launceston manufacturing economy in Chapter 5 are considered here in terms of the relative strength of the linkage patterns. This is accomplished by weighting those proportional data using measures of firm size - number of employees, annual turnover and capital investment (replacement value of capital invested in plant and machinery), to approximate an absolute base.

In these terms, the relative importance of non-Launceston sources overall is substantially increased (Table A10.1).

Table A10.1: Aggregated input linkages of Launceston manufacturers, unweighted and weighted.

Source region	Unweighted Mean[1]	Mean[1] weighted by:		
		Employment	Turnover	Capital Investment
Launceston	44.79	19.59	17.27	16.91
Rest of N. and N.E. Tasmania	6.88	14.66	16.10	17.60
N.W. and W. Tasmania	6.19	5.44	8.60	8.05
Southern Tasmania	6.15	5.92	7.28	7.68
Tasmania unspecified	0.47	3.69	2.26	1.30
SUB-TOTAL: Tasmania	64.48	49.30	51.51	51.54
Victoria	26.13	22.80	27.94	28.46
N.S.W./A.C.T.	4.56	7.03	5.61	6.39
W.A./S.A.	0.97	0.40	0.54	0.60
Qld./N.T.	0.35	0.16	0.18	0.06
Mainland unspecified	1.38	12.26	7.16	8.52
Overseas	2.02	7.95	6.90	4.04
SUB-TOTAL: Outside Tasmania	35.41	50.60	48.33	48.05
Unallocated	0.11	0.09	0.14	0.41
TOTAL	100	100	100	100
No. of firms	174[2]	174[2]	162[3]	158[4]

1. The mean of the percentage of total value of purchases from the regions.
2. No response from one firm.
3. No response to turnover from a further 12 firms.
4. No response to capital investment from a further 16 firms.

Source: Launceston manufacturing survey, 1980.

An unweighted mean dependence on Launceston sources of 45 per cent is reduced to slightly less than 20 per cent, reflecting the small firm orientation to local suppliers. Dependence on non-Launceston Tasmanian sources increases from a mean of 20 per cent to approximately 30 per cent, and the equivalent figures for non-Tasmanian sources are 35 per cent increasing to approximately 50 per cent. This emphasises the role of the larger firm, in general, utilising the state's natural resource base, or alternatively, their dependence on direct sources of semi-manufactured goods. Of specific interest, however, is the negligible change in dependence on Victorian sources when data are weighted. This serves to reinforce the all-embracing Victorian (Melbourne) influence on the Launceston manufacturing economy, regardless of size of firm.

This overall situation is somewhat similar when the firms comprising each of the three principal input linkage subsets defined in Section 5.2 are considered (Table A10.2).

Table A10.2: Input linkage structure of the Launceston manufacturing economy based on unweighted and weighted data.

Source area orientation	Unweighted data		Data weighted by:		
	No. of firms[1]	Percentage of firms	Employment (%)[1]	Turnover (%)[2]	Capital Investment (%)[3]
Inpute linkage subsets:					
Launceston	61	36.31	13.48	8.58	6.89
Elsewhere Tasmania and overseas	39	23.21	44.42	48.18	42.65
Mainland Australia	68	40.48	42.10	43.24	50.47
TOTAL	168	100	100	100	100

1. No response or insufficiently disaggregated responses to regional purchase patterns from seven firms.
2. No response to turnover from a further 12 firms.
3. No response to capital investment from a further 16 firms.

Source: Launceston manufacturing survey, 1980.

Clearly, the importance of the state's natural resource base to Launceston manufacturing is much stronger than that reflected by unweighted data (effectively the number of firms involved). Indeed, the contribution of those firms based on direct Tasmanian sources is roughly the equivalent of those dependent on national core area sources, and the converse of these adjustments highlights a very limited absolute impact from immediately local sources.